OMICRON LAB

ISAQ 100

User Manual

Smart Measurement Solutions

Manual Version: ISAQ100.AE.2

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Using This Manual

This User Manual provides detailed information on how to use the *ISAQ 100* data acquisition system properly and efficiently. The ISAQ 100 User Manual is intended for all users of the *ISAQ 100* system, providing instructions on the operation, usage, and measurement procedures.

Caution: Any user of the *ISAQ 100* system should have fundamental working knowledge of basic electronics, general measurement techniques, and the use of computer-based applications running under Windows environment. Further on the user should be aware of all safety guidelines for working with high voltages in case that the *ISAQ 100* system is used to measure such voltages.

Operator Qualifications and Safety Standards

Working on high-voltage assets can be extremely dangerous. Testing with the *ISAQ 100* must be carried out only by qualified, skilled and authorized personnel. Before starting to work, clearly establish the responsibilities.

Personnel receiving training, instructions, directions, or education on the *ISAQ 100* must be under constant supervision of an experienced operator while working with the equipment.

Testing with the *ISAQ 100* must comply with the internal safety instructions as well as additional relevant documents.

In addition, observe the following safety standards, if applicable:

- EN 50191 (VDE 0104) "Erection and Operation of Electrical Equipment"
- EN 50110-1 (VDE 0105 Part 100) "Operation of Electrical Installations"
- IEEE 510 "IEEE Recommended Practices for Safety in High-Voltage and High-Power Testing"

Conventions and Symbols Used

In this manual, the following symbols indicate important safety information, tips, and manual contents.

Symbol	Description
	Caution: Equipment damage or loss of data possible
	Warning: Personal injury or death of the operating staff or severe damage to objects possible
	Scope mode overview & basics, examples, and function details
	FFT mode overview & basics, examples, and function details
	Data Recorder mode overview & basics, examples, and function details
	Data Analyzer mode overview & basics, examples, and function details

Related Documents

The following documents complete the information covered in the ISAQ 100 User Manual:

Title	Description and Availability
ISAQ 100 Automation Interface Reference Manual	Provides detailed information on the *ISAQ 100 Automation Interface* (available in the *Documentation* directory of the *ISAQ Measurement Suite*).

1 Introduction

1.1 Overview

The *ISAQ 100* system is an optically isolated data acquisition system designed for professionals such as scientists, engineers, and teachers engaged in the field of electronics. ISAQ is an abbreviation for **IS**olated **A**c**Q**uisition.

The underlying concept – universal hardware controlled by the *ISAQ Measurement Suite* software running on a computer – makes the *ISAQ 100* system an efficient and flexible solution for a wide spectrum of applications including:

- **Scope** measurements
  The **Scope** mode of the *ISAQ 100* system measures any voltage signal in the time domain. In the **Scope** mode, you can analyze any electronic circuit but also monitor any physical or chemical process. By using corresponding transducers, with the *ISAQ 100* system you can, for example, monitor current, temperature, pressure, acceleration, and other measurement values.
- **FFT** measurements
  In addition to the scope analysis of signals, with the *ISAQ 100* system you can also analyze signals by means of their frequency spectrum. In the **FFT** mode, you can display and analyze the frequency spectrum of any voltage signal. Consequently, you can analyze physical and chemical measurement values of any kind by using corresponding transducers.
- Data recording and data analysis
  The data recording and data analysis are split into two major modes: **Data Recorder** mode and **Data Analyzer** mode. In the **Data Recorder** mode, you can record signals of any kind. In the **Data Analyzer** mode, you can analyze any signals recorded in the **Data Recorder** mode, online and offline.

The measurement results are available on your computer for further processing and/or documentation.

1.2 Block Diagram

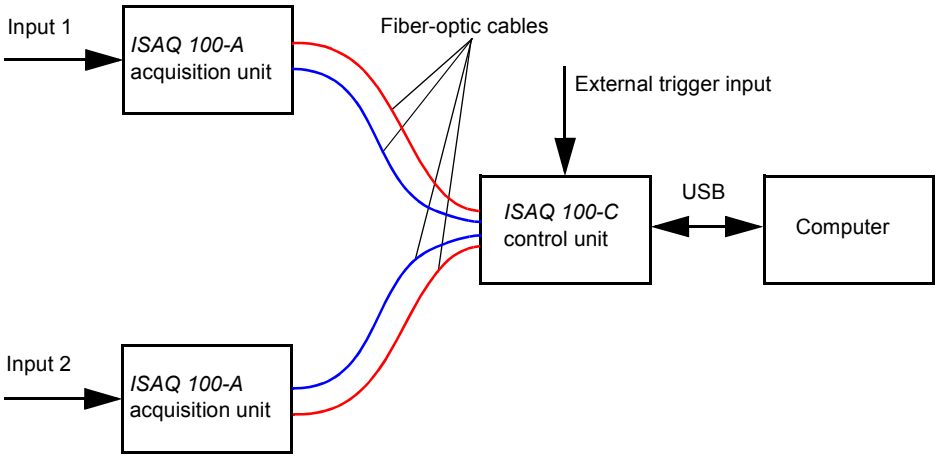


Figure 1-1 Block diagram of the *ISAQ 100* system

The *ISAQ 100* system consists of two *ISAQ 100-A* acquisition units. The *ISAQ 100-A* converts the analog voltage input signal into an optical signal. The optical signal is then sent through a fiber optic cable to the *ISAQ 100-C* control unit. The *ISAQ 100-C* makes the measured data available for the computer over a USB interface.

The *ISAQ Measurement Suite* is a graphical user interface running on a standard Windows computer. With the *ISAQ Measurement Suite,* you can fully control the *ISAQ 100* system as well as monitor and analyze the acquired data.

Additionally, an OLE-compliant automation interface enables full control of the *ISAQ 100* system through several programs and programming languages. Consequently, with the OLE-compliant automation interface, the *ISAQ 100* system can be implemented into automated systems.

1.3 *ISAQ 100-C*

Caution: To avoid damage of the *ISAQ 100-C* control unit, ensure that the external trigger input signals do not exceed the maximum values specified in Table 11-3 "ISAQ 100-C Specifications" on page 114.

The *ISAQ 100-C* provides the following connectors on the front panel:

- **CH 1**: **ISAQ 100-A control**, black fiber-optic connector
- **CH 1**: **ISAQ 100-A data in**, red fiber-optic connector
- **CH 2**: **ISAQ 100-A control**, black fiber-optic connector
- **CH 2**: **ISAQ 100-A data in**, red fiber-optic connector

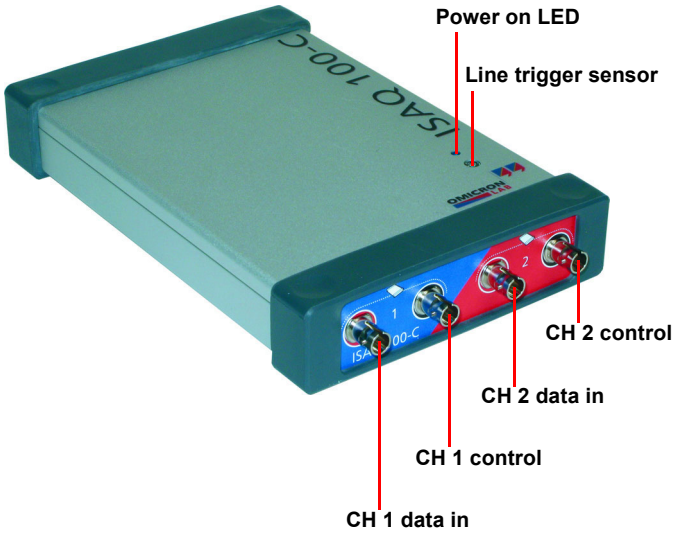


Figure 1-2 *ISAQ 100-C* control unit: front view

The *ISAQ 100-C* provides the following connectors on the rear panel:

- **External trigger input**, BNC connector
- **USB connector**

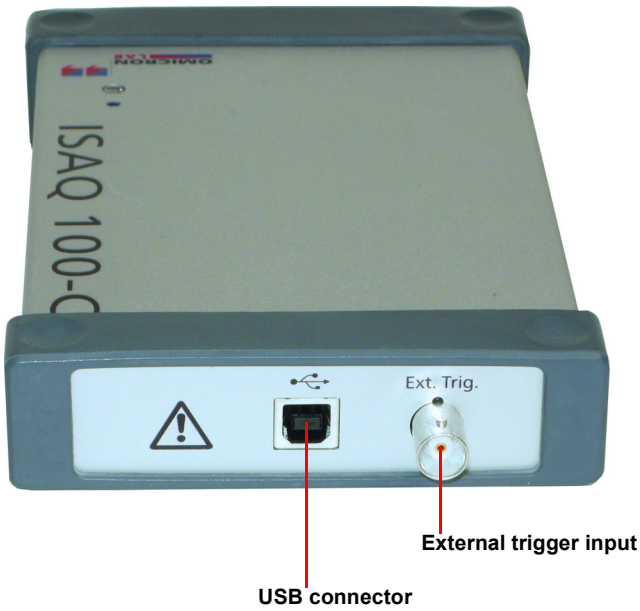


Figure 1-3 *ISAQ 100-C* control unit: rear view

1.4 ISAQ 100-A

Caution: To avoid damage of the *ISAQ 100-A* acquisition unit, ensure that the input signal at the **ISAQ 100-A input** connector does not exceed maximum values specified in Table 11-5 "ISAQ 100-A Absolute Maximum Ratings" on page 114.

The *ISAQ 100-A* provides the following connectors on the front panel:

- **ISAQ 100-A input**, isolated BNC connector
- **ISAQ 100-C data out**, red fiber-optic connector
- **ISAQ 100-C control**, black fiber-optic connector

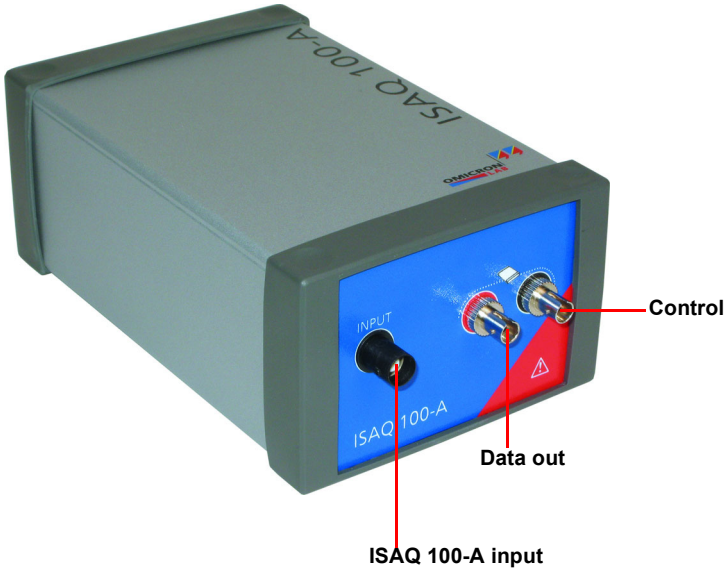


Figure 1-4 *ISAQ 100-A* acquisition unit

1.5 Designated Use

Warning: The *ISAQ 100* system is a Class 1M laser product emitting invisible laser radiation. Do not view directly with optical instruments.

The *ISAQ 100* data acquisition system is an acquisition and analysis system for detecting, recording, and analyzing voltage signals in many applications. It can be used as a real-time scope, FFT analyzer, data recorder, and isolated amplifier for laboratory and field measurements. By using corresponding transducers, various physical and chemical values can be acquired.

Due to its special design, the *ISAQ 100* system allows potential-free measurements. This means that the *ISAQ 100-A* acquisition unit can be put on high-voltage levels for performing measurements, for example, in high-voltage areas.

Warning: The maximum working voltage in standard laboratory environments is 1000 V CAT II between the input connector and ground and 200 V CAT II between the input connectors. For working in mains applications use an adequate test probe. Moreover, always obey the safety instructions in this manual for safe operation.

Warning: Do not remove any parts of the housing of the *ISAQ 100* system while making measurements. Especially ensure that the rubber covers of the *ISAQ 100-A* acquisition unit are well in place before using the unit.

The measurement area can be split into three parts as shown in the following figure.

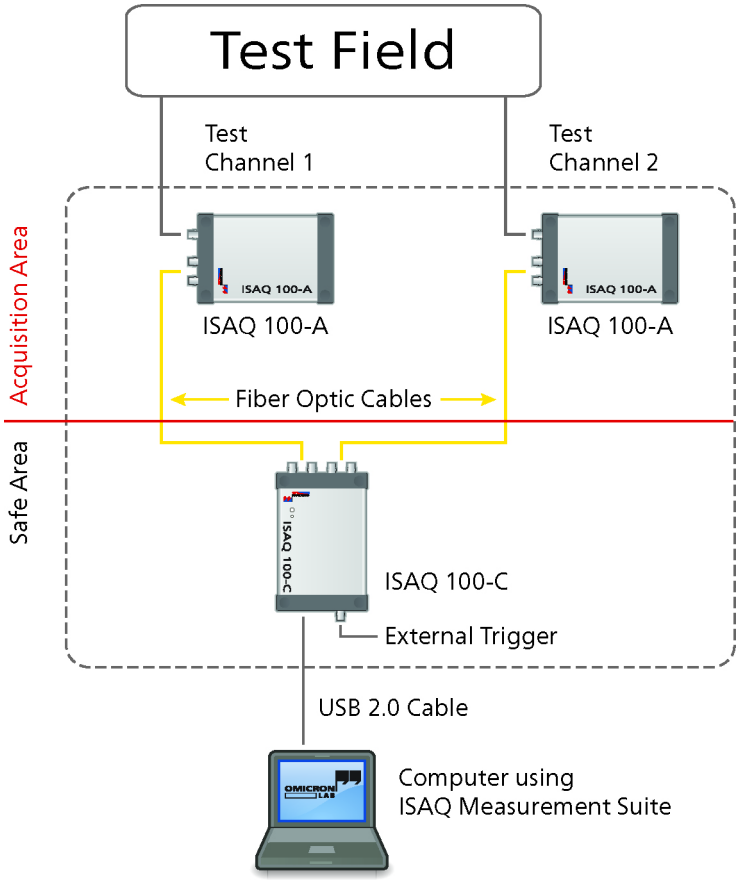


Figure 1-5 Designated use of the *ISAQ 100* system

Test Field

The test field is where your device under test is placed.

Warning: Obey all rules for your specific test field.
If working in high-voltage areas establish a safe area. Never touch parts under high voltage. Do not use a high-voltage test setup without proper grounding. For measurements above 1000 V, comply with the standard high-voltage safety regulations for the high-voltage area. Particularly, use appropriately insulated cables.

Acquisition Area

In the acquisition area the *ISAQ 100-A* acquisition unit is placed. This area can be a high-voltage area and therefore a dangerous zone.

Warning: If measuring high-voltage levels referenced to ground, establish a safe area.

The *ISAQ 100-A* acquisition unit is safely isolated for up to 1000 V floating voltage. This means that for measurements up to 1000 V floating voltage the acquisition area does not necessarily have to be part of a safe area.

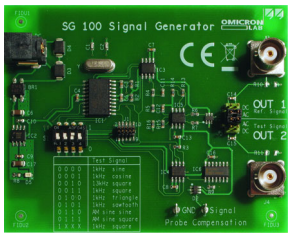
Note: The *ISAQ 100-A* acquisition unit does not provide a ground connector. Therefore if you want to ground the *ISAQ 100-A*, connect the outer connector of the *ISAQ 100-A* input to ground.

Warning: For measurements in areas of up to 1000 V we recommend using the 1000 V insulated BNC cables delivered with the *ISAQ 100* system. Ensure that also all accessories and connection cables fulfill adequate safety insulation.

Safe Area

Keeping the safety distance from the acquisition area according to high-voltage safety standards, the safe area is free of any dangerous voltages. People and devices within this area are therefore fully protected due to the optical isolation between the *ISAQ 100-C* and the *ISAQ 100-A*.

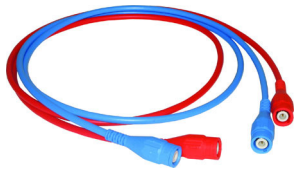
1.6 Delivery

ISAQ 100-C	2 × *ISAQ 100-A*	*ISAQ Measurement Suite*
USB cable	2 × fiber-optic cables, 1 m	2 × insulated BNC 50 Ω cables, 1 m (m-m)
 *SG 100* signal generator - test object on a PCB (see 10 "SG 100 Signal Generator" on page 109)	Wide-range AC power supply including mains input plugs for different national standards	ISAQ 100 User Manual

Note: The delivered items may differ slightly from the ones shown.

1.7 Additional Accessories

The following additional accessories are available for purchase from OMICRON Lab.

		
ISAQ 100-A D-Cell batteries	Fiber-optic duplex patch cables ST-ST 50/125 µm 0.5 m, 1 m, 3 m, 5 m, 20 m	Insulated BNC 50 Ω cables, 1 m (m-m)

For information on how to exchange the *ISAQ 100-A* batteries, see 9 "Changing the Batteries of the ISAQ 100-A" on page 105.

2 Getting Started

Caution: Before installing the *ISAQ 100* system, observe the designated use (see 1.5 "Designated Use" on page 14) and check the system requirements, the environmental conditions, and the power requirements (see 11 "Technical Data" on page 113).

2.1 Installing the *ISAQ Measurement Suite*

Caution: Install the *ISAQ Measurement Suite* by using the delivered CD-ROM before connecting the *ISAQ 100* system to your computer.

The *ISAQ Measurement Suite* on the delivered CD-ROM controls the operation of the *ISAQ 100* system. Install the *ISAQ Measurement Suite* first before you connect the *ISAQ 100* system to the computer. Put the *ISAQ 100* CD-ROM in the CD/DVD drive and follow the instructions on the screen. For installation support, visit the OMICRON Lab Web site *www.omiron-lab.com* or contact your nearest support center (see "Contact Information / Technical Support" on page 119).

2.2 Connecting the *ISAQ 100-C* to the Computer

The *ISAQ 100-C* communicates with the computer through USB interface. Connect the *ISAQ 100-C* USB connector on the rear panel to the USB connector of your computer using the USB cable delivered with your *ISAQ 100* system.

Note: The *ISAQ 100-C* is equipped with a blue LED that indicates the status of the control unit and the system. When permanently lit, the unit is connected to a computer, is sufficiently powered, and has been configured for use with the computer. A flashing LED indicates a hardware or software problem at the *ISAQ 100-C* or the connected computer. If you encounter a flashing LED, contact the OMICRON Lab technical support (see "Contact Information / Technical Support" on page 119).

2.3 Connecting the *ISAQ 100-A* to the *ISAQ 100-C*

The *ISAQ 100-C* control unit communicates with the *ISAQ 100-A* acquisition units through a two-channel fiber-optic cable (see Table 11-2 "ISAQ 100-A Specifications" on page 113). Connect one side of the two-channel fiber-optic cable delivered with the *ISAQ 100* system to the *ISAQ 100-C* as shown in

Figure 2-1 "Connecting the ISAQ 100-C". Connect the other side of the same fiber optic cable to one *ISAQ 100-A* as shown in Figure 2-2 "Connecting the ISAQ 100-A". If you want to use both channels for your measurement, connect the other *ISAQ 100-A* to the *ISAQ 100-C* by using the second fiber-optic cable and repeat the steps shown in Figures 2-1 and 2-2.

Figure 2-1 Connecting the *ISAQ 100-C*

Figure 2-2 Connecting the *ISAQ 100-A*

Caution: Take particular care when installing the fiber-optic cables. Avoid mechanical stress, for example, strong tension and never overbend the fiber-optic cables. This might break the inner glass fibers and lead to transmission errors.

Caution: To get precise values of the phase difference, the test setup has to be symmetrical. Consequently, all cables between the units in the reference and in the test channel including the fiber-optic cables must have the same length.

2.4 Starting the *ISAQ Measurement Suite*

To start the *ISAQ Measurement Suite*, click the **Start** button, and then point to **All Programs**. Point to **ISAQ 100 Measurement Suite**, and then click **ISAQ**.

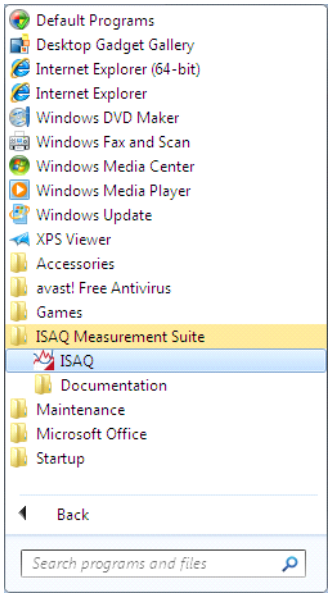


Figure 2-3 Starting the *ISAQ Measurement Suite*

2.5 Operating the *ISAQ 100* System

Warning: Before connecting the *ISAQ 100* system to your test field, switch off all high voltages of the test field.

Warning: Before switching on the high voltage of your test field, make sure to clear the high-voltage area.

The operation of the *ISAQ 100* system is described in detail in the following chapters starting with 3 "Scope Mode" on page 25. Read the information about the operating modes carefully and follow the safety and operation instructions therein.

2.6 Disconnecting the *ISAQ 100* System

Warning: Before disconnecting the *ISAQ 100* system, switch off all high-voltages of your test field.

To disconnect the *ISAQ 100* system:

1. Disconnect the BNC connector from the *ISAQ 100-A* acquisition unit.
2. Disconnect the fiber-optic link from the *ISAQ 100-A* acquisition unit.
3. Repeat steps 1 and 2 for the second *ISAQ 100-A* acquisition unit, if used.
4. Disconnect the fiber-optic link(s) from the *ISAQ 100-C* control unit.
5. Disconnect the USB cable from the *ISAQ 100-C* control unit and from your computer.

2.7 How to Proceed

Now, you are ready to work with your *ISAQ 100* system. You can proceed with the following sections of the ISAQ 100 User Manual to learn about the operating modes of the *ISAQ 100* system. By reading these sections with practical examples you will learn to work with the *ISAQ Measurement Suite*.

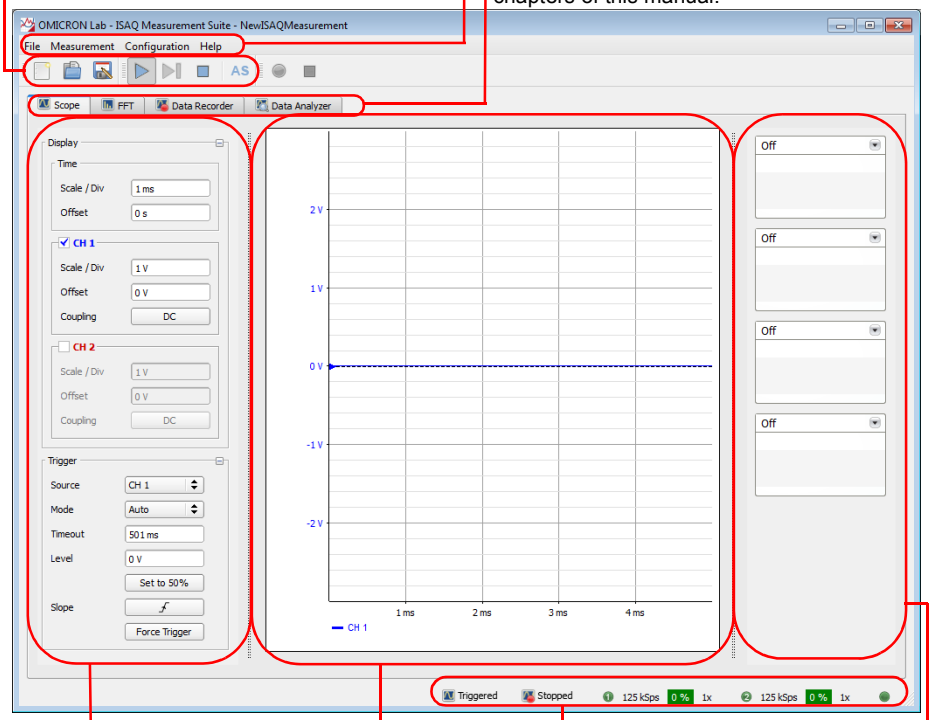
In Section 7 "Common Functions" you will find the *ISAQ Measurement Suite* basics common to all operating modes. In Section 9 "Changing the Batteries of the ISAQ 100-A" you can learn how to change the battery of the *ISAQ 100-A*.

3 Scope Mode

Menu bar
Provides access to all *ISAQ 100* functions. See 7.1 "Menus and Commands" on page 85.

Toolbar
Contains the most important controls. See 3.1.4 "Toolbar" on page 29.

Mode tabs
Enable a quick change between the *ISAQ 100* operating modes. For information about the **FFT** mode, **Data Recorder** mode and **Data Analyzer** mode, refer to the respective chapters of this manual.



Scope control
Contains the **Display** and **Trigger** controls. See 3.3 "Scope Control" on page 43.

Status bar
Shows the trigger status as well as the signal level, the measurement status, settings and overload. See 7.2 "Status Bar" on page 87.

Scope graphical display
Use the shortcut menu to optimize the display. See 3.1.2 "Scope Graphical Display" on page 27.

Result display
Select the result format and get results. See 3.1.3 "Result Display" on page 28.

Figure 3-1 **Scope** mode view

3.1 Overview

This section gives you a short overview on the **Scope** mode view. For a detailed function description, see 3.3 "Scope Control" on page 43.

3.1.1 Scope Control

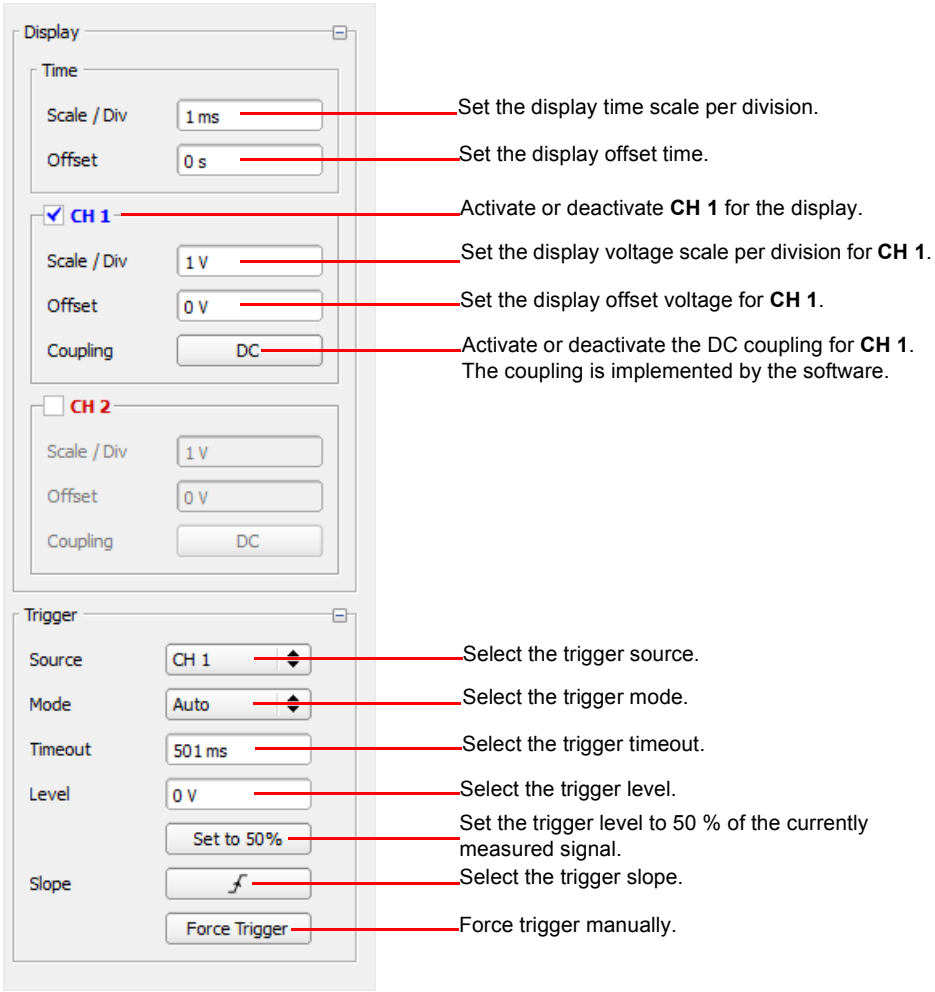


Figure 3-2 **Scope** control

Note: The **CH 2** settings are as for **CH 1**.

3.1.2 Scope Graphical Display

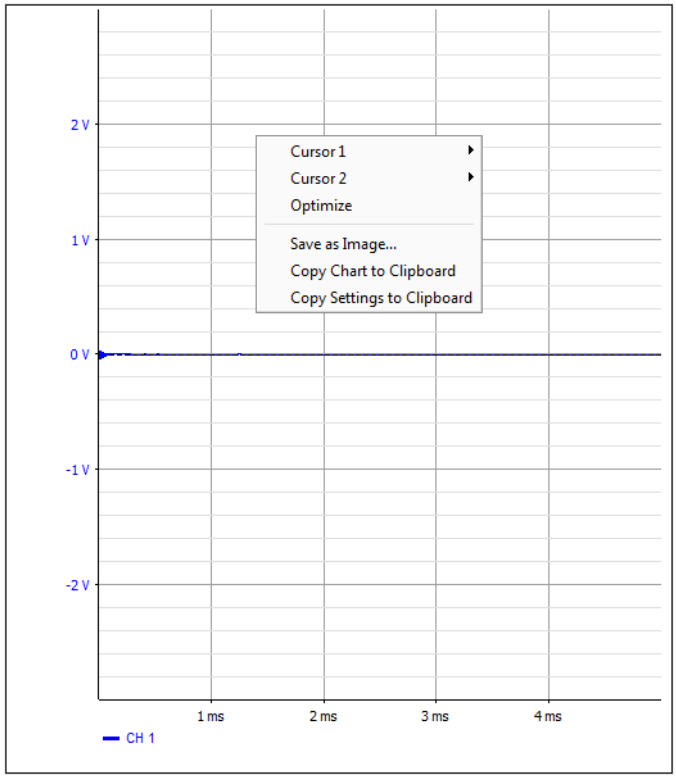


Figure 3-3 **Scope** graphical display

Right-click in the diagram to open the shortcut menu. Use the shortcut menu to set the cursors, optimize the diagram display, and export the diagrams and/or settings.

Note: By using the **Copy Chart to Clipboard** and **Copy Settings to Clipboard** functions, you can easily export your diagram into other Windows-based programs. For more information, see 8 "Advanced Display Options" on page 99. The **Trigger Level** is visualized by a blue arrow ending in a dashed line. You can drag the **Trigger Level** to another level.

3.1.3 Result Display

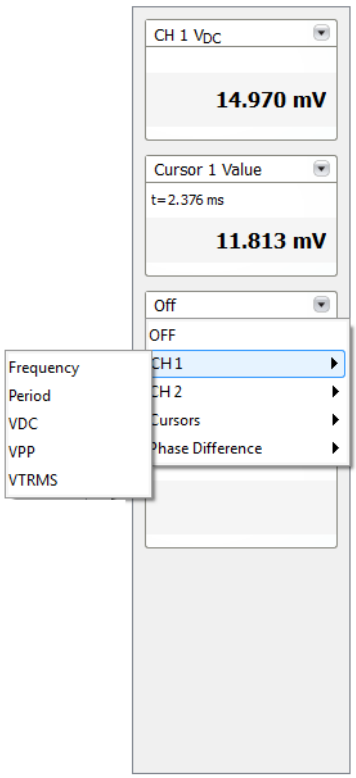


Figure 3-4 Result display

In the result display, you can select different result formats and display the results.

Note: By default, the result displays are set to **Off**. Click the arrow, and then select the result source and format in the list.

3.1.4 Toolbar

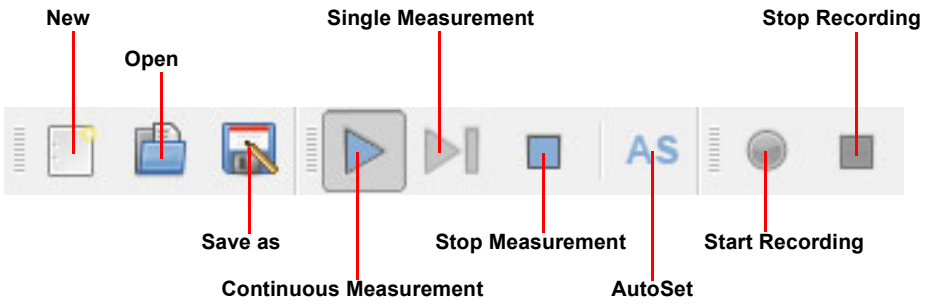


Table 3-1 Toolbar buttons

Button	Description
New	Sets all settings to default values and the filename to NewISAQMeasurement.dat.
Open	Opens Windows Explorer to browse to the .setting file you want to open.
Save as	Opens Windows Explorer to browse to the location you want to save the .setting and .dat files.
Continuous Measurement	Starts a periodically repeated measurement.
Single Measurement	Starts a single measurement.[1]
Stop Measurement	Stops a measurement. The last result remains displayed. Stops the recording if data recording is running.
AutoSet	Finds the range within which the signal falls (autorange) and sets the trigger level. Optionally sets a default trigger level.

1. Limited to max. 1 s.

Note: The toolbar buttons of the **Data Recorder** mode (see 5.1.4 "Toolbar" on page 69) are also available in the **Scope** mode, thus enabling you to start recording without leaving the **Scope** mode. The **Data Recorder** toolbar buttons are only accessible if all required settings for starting the recording are set in the **Data Recorder** wizard.

3.2 Examples

By working through the examples in this section, you will learn step by step how to use the **Scope** mode of the *ISAQ 100* system.

Note: The following examples assume the default settings of the *ISAQ Measurement Suite*.

3.2.1 Example 1: Quick Start with the Scope Mode

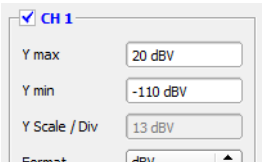
Expected example duration: 10 minutes.

In this example, you will learn how to:

- Handle the *SG 100* signal generator
- Use the **AutoSet** function
- Measure the V_{TRMS} (true root-mean-square value), V_{pp} (peak-peak value), and frequency of different signals

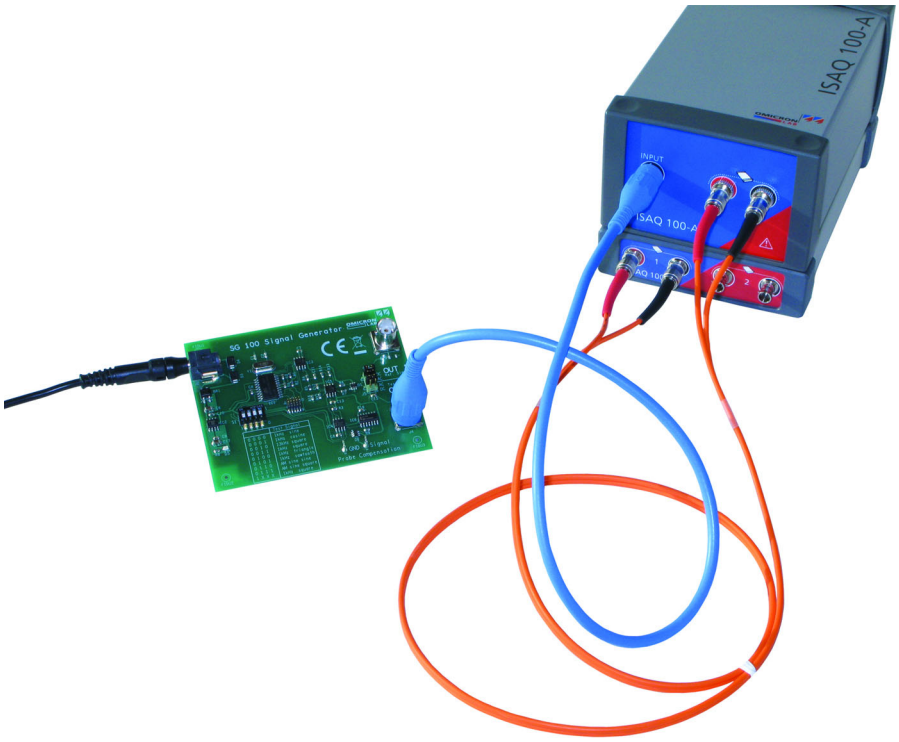
To go through the example, proceed as follows:

1. Assemble the *ISAQ 100* system as described in 2.3 "Connecting the ISAQ 100-A to the ISAQ 100-C" on page 19 and connect the *ISAQ 100-C* to your computer by using the USB cable.
2. Start the *ISAQ Measurement Suite.*
3. Select the **CH 1** check box.

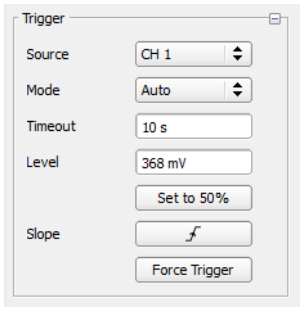


4. Power the *SG 100* signal generator as described in 10 "SG 100 Signal Generator" on page 109, and then connect the **OUT 2** connector of the *SG 100* signal generator to the **CH 1** input of the *ISAQ 100-A*.

5. Set the coupling of the **OUT 2** output of the signal generator to AC by the respective jumper (see Figure 10-3 "SG 100 signal generator: jumpers for setting the coupling" on page 111).

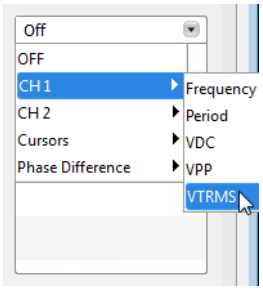


6. Generate a sine signal of frequency 1 kHz by setting the switch on the *SG 100* signal generator to (0000) (see Figure 10-4 "SG 100 signal generator: switch for setting the test signal" on page 112).
7. Set the trigger source to **CH 1**.

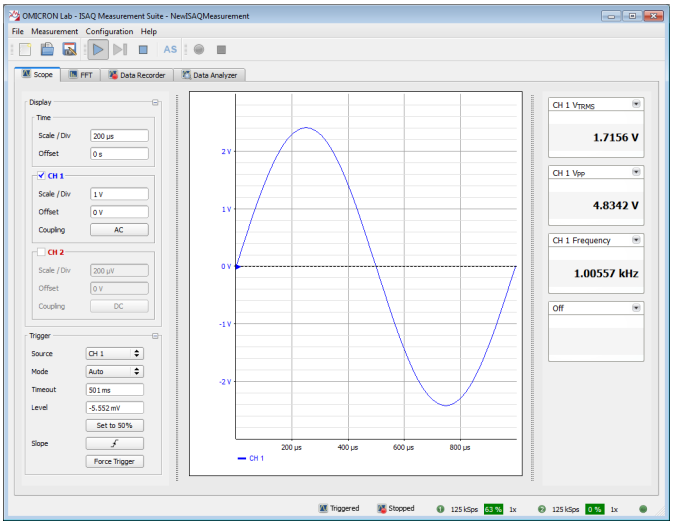


8. Click the **AutoSet** toolbar button AS.

9. In the first result display, click the drop-down arrow, point to **CH 1**, and then click **VTRMS**.



10. In the second result display, click the drop-down arrow, point to **CH 1**, and then click **VPP**.
11. In the third result display, click the drop-down arrow, point to **CH 1**, and then click **Frequency**.



Result: The generated sine signal has a root-mean-square value of 1.72 V, a peak-peak value of 4.83 V, and a frequency of 1.01 kHz. Your result may slightly differ because each measurement setup is different.

Now, change the signal form by setting the switch on the *SG 100* signal generator (see Figure 10-4 "SG 100 signal generator: switch for setting the test signal" on page 112) and observe the signal in the **Scope** graphical display and the respective measurement results in the result displays.

Congratulations! You have learned how to:

- Handle the *SG 100 SG 100* signal generator
- Use the **AutoSet** function
- Measure the V_{TRMS}, V_{pp}, and frequency of different signals

To learn more about using the **Scope** mode, continue with the next example.

3.2.2 Example 2: Scope Cursors

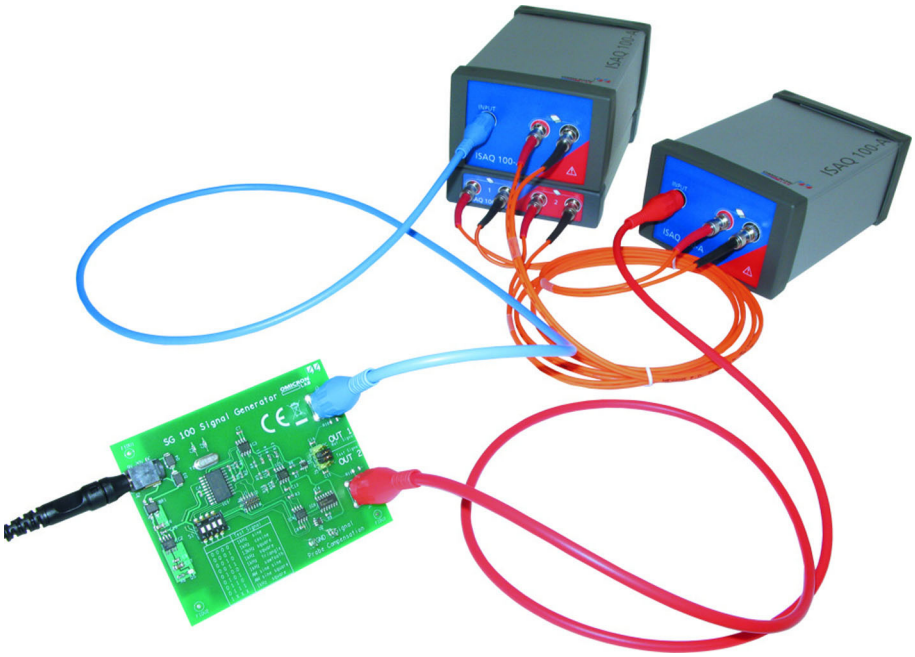
Expected example duration: 15 minutes.

In this example, you will learn how to:

- Activate the **CH 2** channel
- Handle the *SG 100* signal generator
- Handle the cursors
- Measure the phase shift of two signals

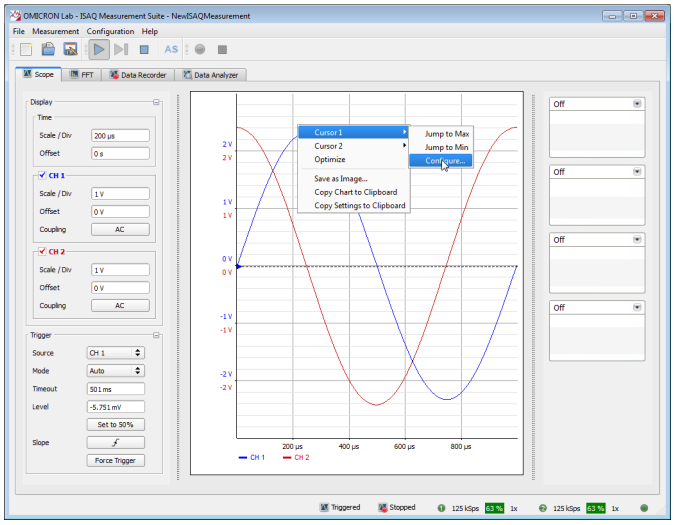
To go through the example, proceed as follows:

1. Start the *ISAQ Measurement Suite.*
2. Connect the **OUT 1** connector of the *SG 100* signal generator to the **CH 1** input of the *ISAQ 100-A* and the **OUT 2** connector of the *SG 100* signal generator to the **CH 2** input of the *ISAQ 100-A*.

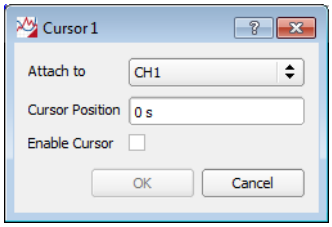


3. Generate a cosine signal by setting the switch on the *SG 100* signal generator to (0001) (see Figure 10-4 "SG 100 signal generator: switch for setting the test signal" on page 112).
4. Select the **CH 2** check box to activate the **CH 2** channel.
5. Set the trigger source to **CH 1**.
6. Click the **AutoSet** toolbar button AS.

7. Right-click in the graphical display, point to **Cursor 1**, and then click **Configure**.

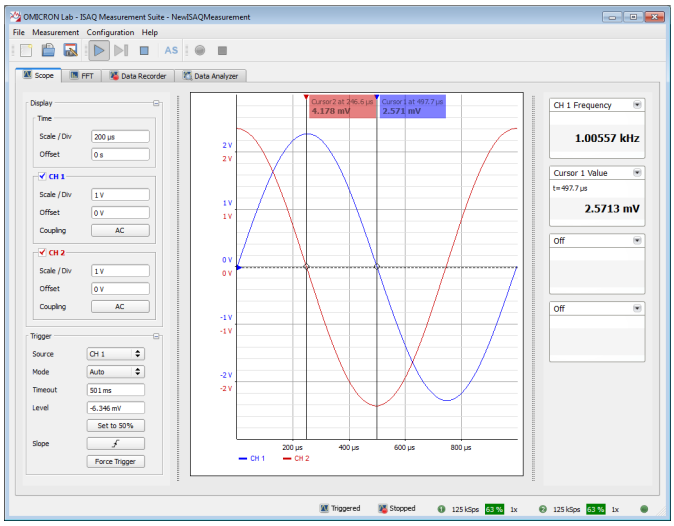


8. In the **Cursor 1** dialog box, attach the cursor to **CH 1**, and then select the **Enable Cursor** check box.

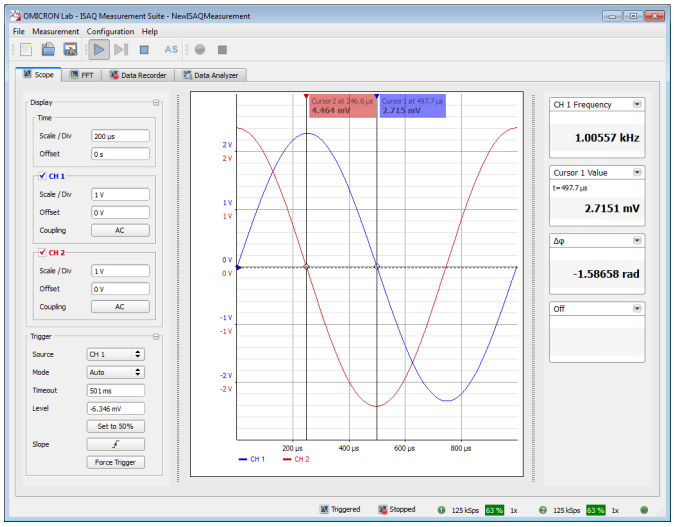


9. Repeat steps 7 and 8 to activate **Cursor 2** but this time attach **Cursor 2** to **CH 2**.

10. Set the cursors to the points where the signals cross the x-axis. Observe the cursor values and the difference Delta (C1 – C2) by selecting the respective measurements in the result display.



11. In the third result display, point to **Phase Difference**, and then click **Rad** to measure the phase shift of the signals.



Result: The measured phase shift is –1.586 rad. Your result may slightly differ because each measurement setup is different.

Note: Alternatively, you can set the cursors for the **CH 1** channel by double-clicking in the graphical display. To delete the cursors, double-click the cursor line.

Congratulations! You have learned how to:

- Activate the **CH 2** channel
- Handle the *SG 100* signal generator
- Handle the cursors
- Measure the phase shift between two signals

To learn more about using the **Scope** mode, continue with the next example.

3.2.3 Example 3: Advanced Scope Functions

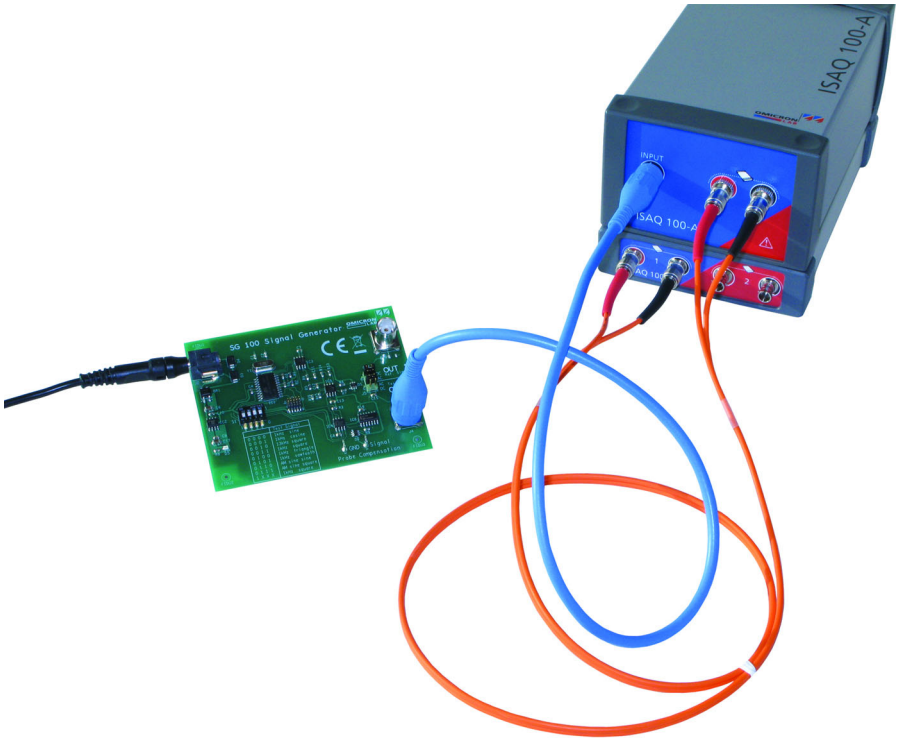
Expected example duration: 10 minutes.

In this example, you will learn how to:

- Set the sample rate
- Use the trigger settings

To go through the example, proceed as follows:

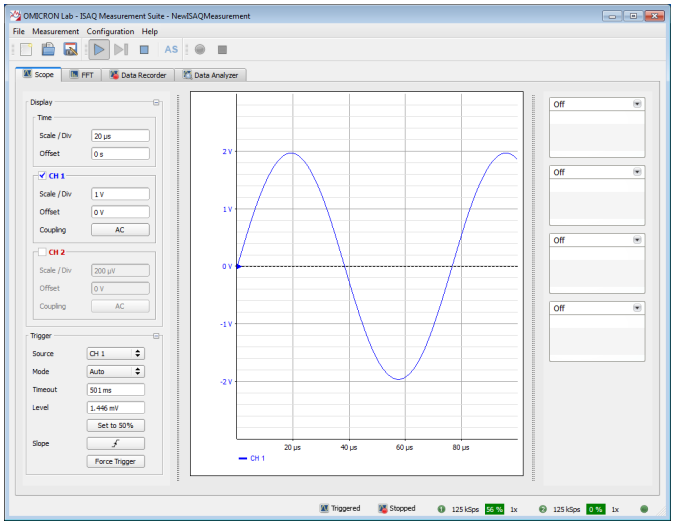
1. Start the *ISAQ Measurement Suite.*
2. Connect the **OUT 2** connector of the *SG 100* signal generator to the **CH 1** input of the *ISAQ 100-A*.



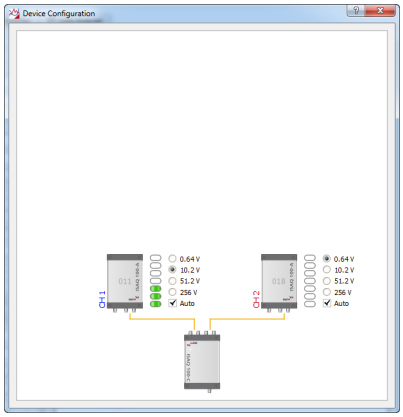
3. Generate a square signal of frequency 13 kHz by setting the switch on the *SG 100* signal generator to (0010) (see Figure 10-4 "SG 100 signal generator: switch for setting the test signal" on page 112).
4. Set the trigger source to **CH 1**.

5. Click the **AutoSet** toolbar button AS.

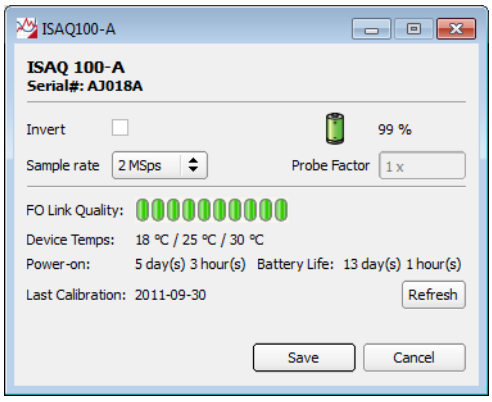
   Note: Due to the low default sample rate of 125 kSps, the graphical display shows a sine wave.



6. On the **Configuration** menu, click **Device Configuration**.

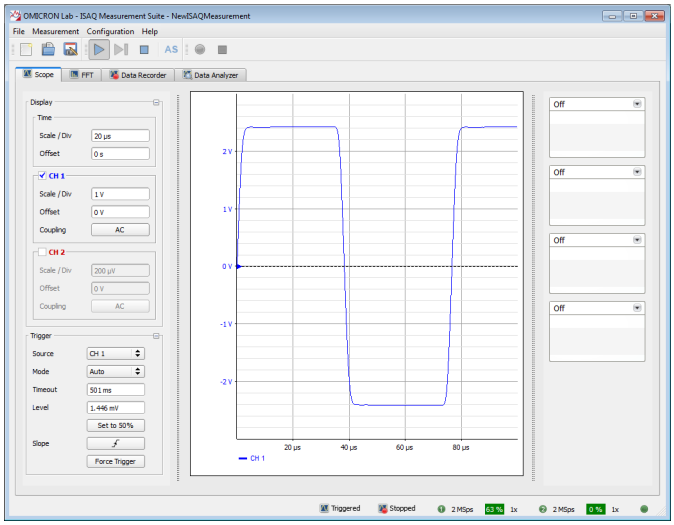


7. In the **Device Configuration** window, click the *ISAQ 100-A* device symbol, and in the **ISAQ 100-A** device information window select a sample rate of 2 MSps.

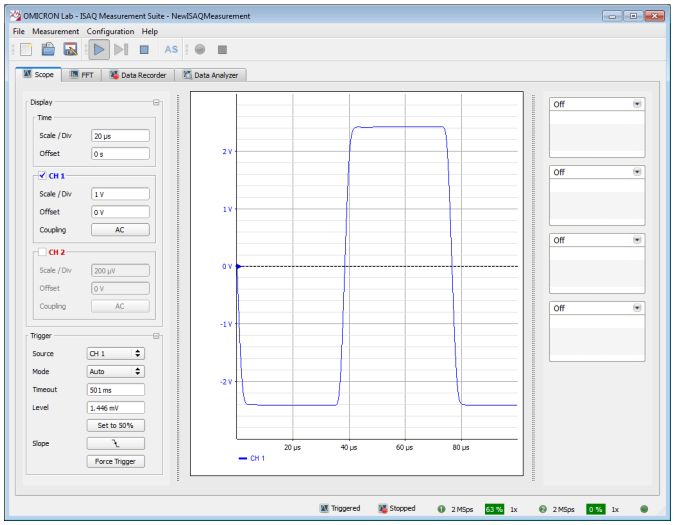


Note: For detailed information about configuring the *ISAQ 100* system, see 7.5 "Device Configuration" on page 89.

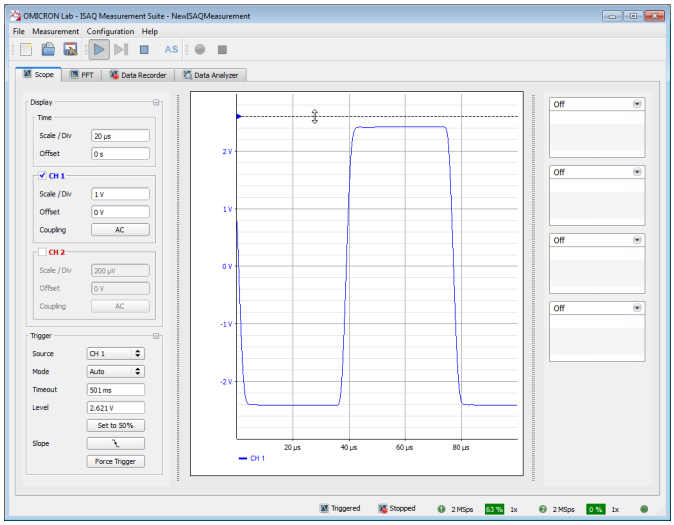
8. Now, the graphical display shows a square signal.



9. Now, click the **Trigger Slope** button to toggle between rising and falling slope.

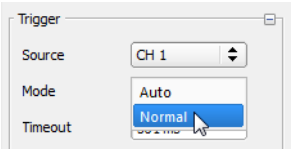


10. By default, the trigger mode is set to **Auto**. Click and drag the trigger level in the graphical display above the displayed signal.

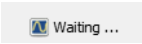


11. Since the trigger level is higher than the measured signal, no trigger event appears. After the trigger timeout has elapsed, a forced trigger is activated. This leads to the rolling signal.

12. In the **Scope** control, set the trigger mode to **Normal**.



13. The displayed signal freezes and the trigger status icon in the status bar displays **Waiting**. The **Trigger Timeout** is not active.



Result: To display a square signal of frequency 13 kHz, the sample rate of 125 kSps is too low. Consequently, you must increase the sample rate.
The **Auto** trigger mode starts rolling when no trigger event occurs, the **Normal** trigger mode waits until a trigger occurs.

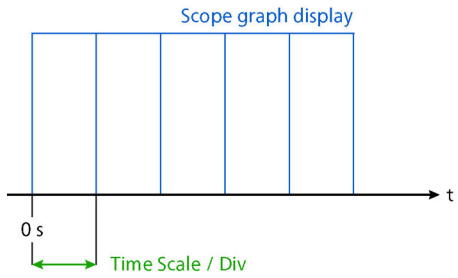
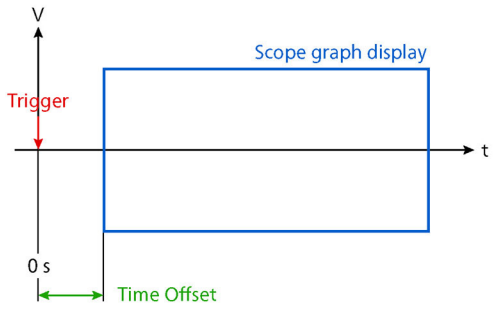
Congratulations! You have learned how to:

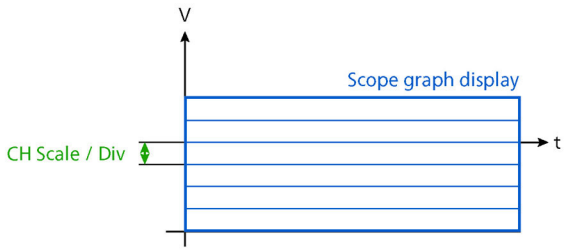
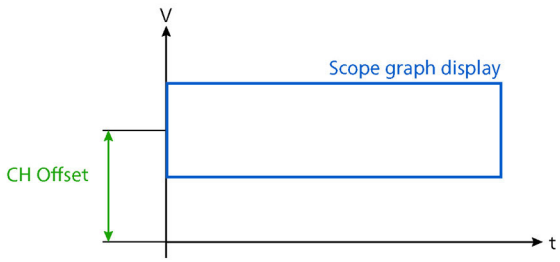
- Set the sample rate
- Change the trigger level
- Switch between **Auto** and **Normal** trigger mode

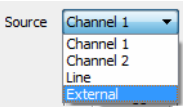
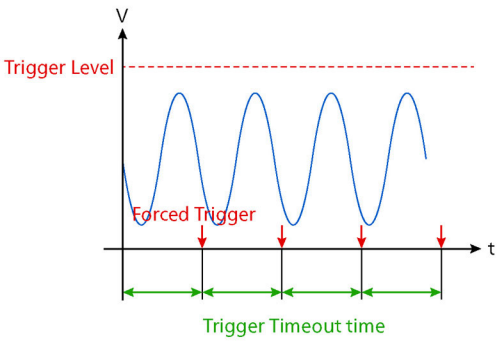
By working through the examples in this chapter, you have learned how to use the **Scope** mode. Refer to the overview chart in 3 "Scope Mode" on page 25 and try different settings to examine their effects on the measurement results.

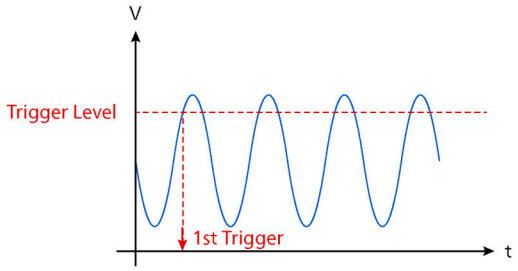
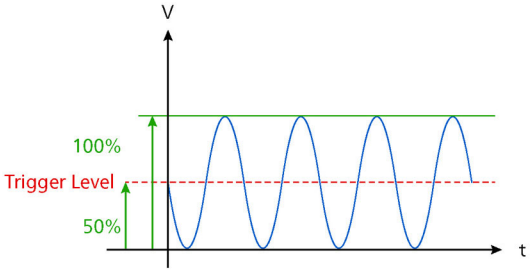
3.3 Scope Control

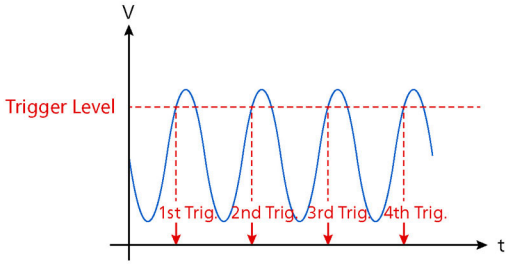
This section describes in detail the **Scope** control (see Figure 3-2 "Scope control" on page 26).

Time	
Scale/Div	Defines the displayed time within a division for the time axis. 
Offset	Sets the **Scope** graphical display offset time. This means a shift of the **Scope** graphical display on the time axis by the time set in the **Time Offset** field. The reference point for the offset is the trigger event that reflects 0 s on the scale. 

CH 1, CH 2	
Scale/Div	Defines the displayed voltage within a division for the y-axis. 
Offset	Shifts the **Scope** graphical display for the corresponding channel along the y-axis. 
Coupling	With the *ISAQ 100* system, you can switch between AC and DC coupling. DC When the button displays **DC**, the DC coupling is active. This means that the input signal including its DC offset is displayed. AC Press the coupling button to select **AC**. The input signal's DC offset is filtered and only the AC components of the signal are displayed. **Note:** The coupling is implemented by the software.

Trigger	
Source	 Selects the trigger source.
Mode	Auto The **Trigger Mode Auto** forces a trigger after the **Trigger Timeout** time when there is no appearing trigger event during this time. Normal The **Trigger Mode Normal** only triggers when a trigger event appears. **Note:** The advantage of the **Trigger Mode Auto** is that the display is updated after every passed **Trigger Timeout** time. Therefore, changes of the input signal are shown. This, for example, helps to set the **Trigger Level** to an appropriate value. **Note:** The trigger holdoff is fixed to 500 ms.
Timeout	Active for the **Trigger Mode Auto**. After passing the **Trigger Timeout** time without a trigger event a trigger is forced. 

Level	Defines at which voltage level the trigger reacts. You can set **Trigger Level** either by entering the level into the **Trigger Level** field or by dragging the trigger level marker in the **Scope** graphical display to the level you want to set. You can also use the mouse wheel to adjust the trigger level.  **Note: Level** is only available if **CH 1** or **CH 2** has been selected as trigger source.
Set to 50%	Set to 50% Pressing the **Set to 50%** button automatically sets the **Trigger Level** to 50 % of the detected signal of the **Trigger Source**. 

Slope	When the **Trigger Slope** button shows a rising slope, a trigger is only activated when the trigger signal passes the **Trigger Level** by a rising slope. When the **Trigger Slope** button is set to a falling slope, the trigger is activated when the **Trigger Level** is passed by a falling slope only. **Note:** The following figure shows how the triggers would be activated by setting the **Trigger Slope** to a rising slope.  **Note: Slope** is only available if **CH 1**, **CH 2**, or **External** has been selected as trigger source.
Force Trigger	Pressing the **Force Trigger** button activates the trigger without detecting an appearing trigger event on the selected **Trigger Source** input.

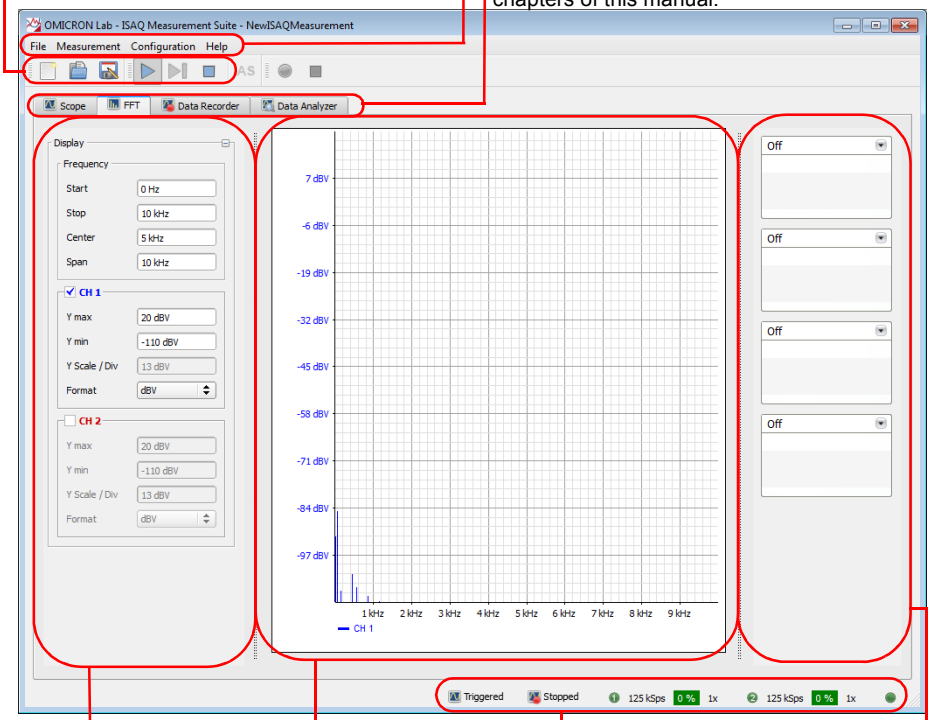
4 FFT Mode

The Fast Fourier Transformation (FFT) mode shows the frequency spectrum of the signals displayed in the **Scope** mode. It is used to detect high-frequency interferences not visible in the time domain or to evaluate the signal-to-noise ratio (SNR).

Menu bar
Provides access to all *ISAQ 100* functions. See 7.1 "Menus and Commands" on page 85.

Toolbar
Contains the most important controls. See 3.1.4 "Toolbar" on page 29.

Mode tabs
Enable a quick change between the *ISAQ 100* operating modes. For information about the **Scope** mode, **Data Recorder** mode and **Data Analyzer** mode, refer to the respective chapters of this manual.



FFT control
Contains the **FFT** graphical display controls. See 4.1.1 "FFT Control" on page 50.

Status bar
Shows the trigger status as well as the signal level, the measurement status, settings and overload. See 7.2 "Status Bar" on page 87.

FFT spectrum display
Use the shortcut menu to optimize the display. See 4.1.2 "FFT Graphical Display" on page 51.

Result display
Select the result format and get results. See 4.1.3 "Result Display" on page 52.

Figure 4-1 **FFT** mode view

4.1 Overview

This section gives you a short overview on the **FFT** mode view. For a detailed function description, see 4.3 "FFT Control" on page 62.

4.1.1 FFT Control

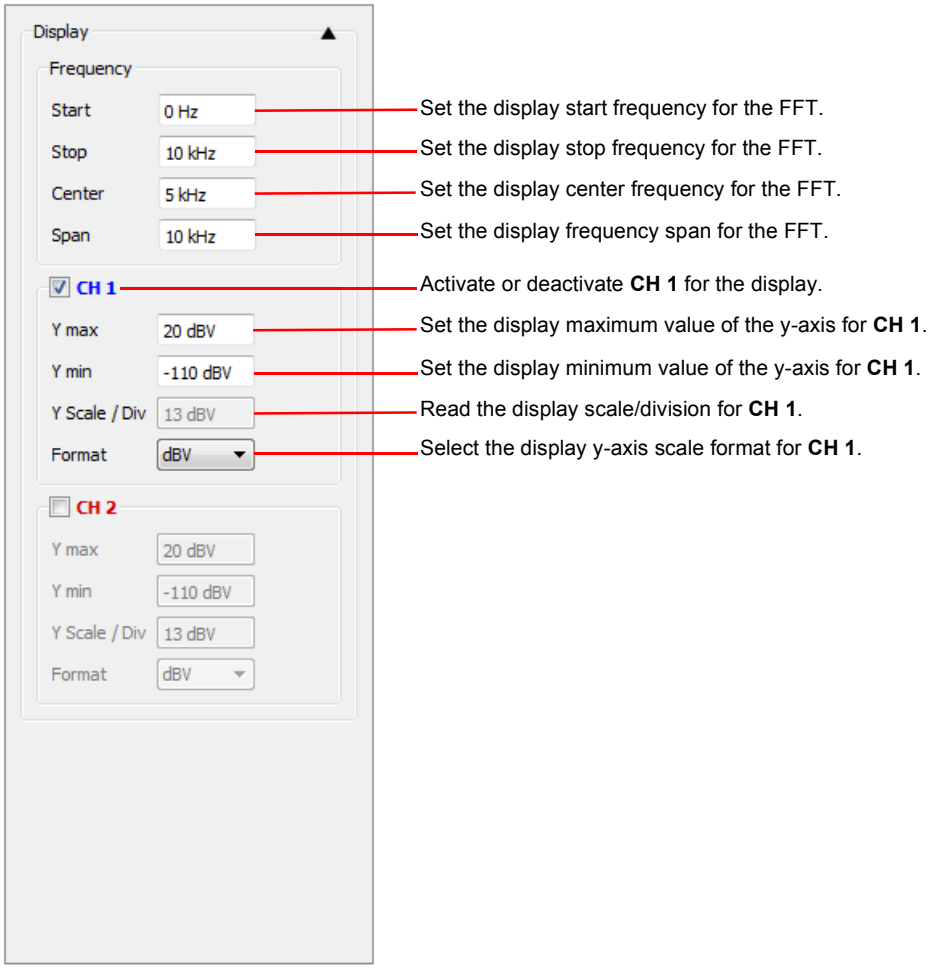


Figure 4-2 **FFT** control

Note: The **CH 2** settings are as for **CH 1**.

Note: The **CH 1** and **CH 2** check boxes also control the input channels in the **Scope** mode and the other way around.

4.1.2 FFT Graphical Display

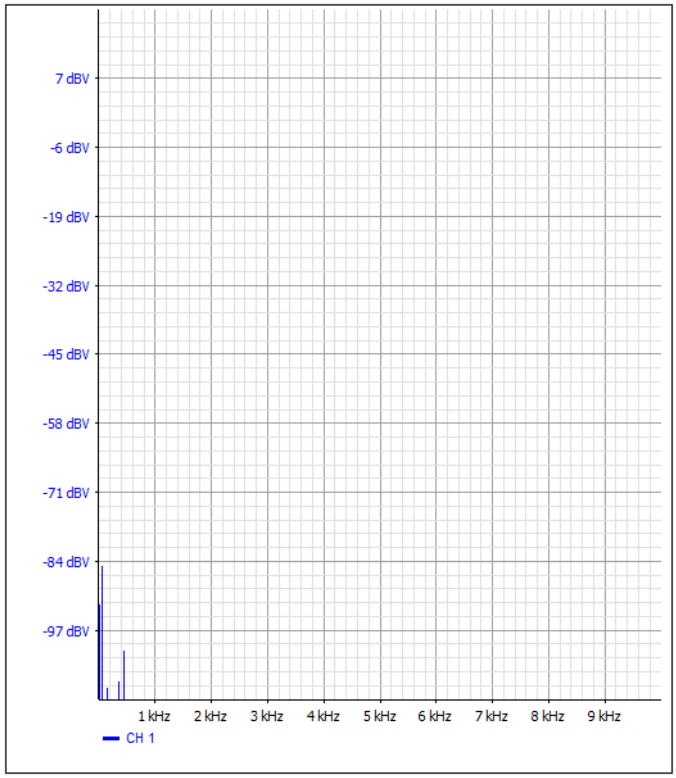


Figure 4-3 FFT graphical display

Right-click in the diagram to open the shortcut menu. Use the shortcut menu to set the cursors, optimize the diagram display, and export diagrams and/or settings.

Note: By using the **Copy Chart to Clipboard** and **Copy Settings to Clipboard** functions, you can easily export your diagram into other Windows-based programs. With **Save as Image…** you can save the graph as an image. For more information, see 8 "Advanced Display Options" on page 99.

4.1.3 Result Display

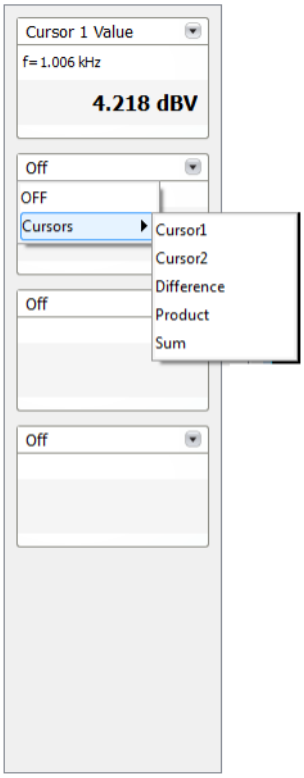


Figure 4-4 Result display

In the result display, you can select cursors and operations between their values and display the results.

Note: By default, the result displays are set to **Off**. Click the drop-down arrow to open the menu for choosing the result source and format. (The menu item **Cursors** appears as soon as at least one cursor is activated.)

4.1.4 Toolbar

For the toolbar, see 3.1.4 "Toolbar" on page 29.

4.2 Examples

By working through the examples in this section, you will learn step by step how to use the **FFT** mode of the *ISAQ 100* system.

4.2.1 Example 1: FFT Basics

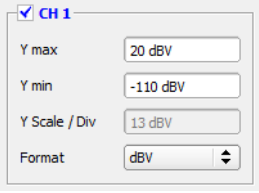
Expected example duration: 15 minutes.

In this example, you will learn how to:

- Start the **FFT** mode
- Measure the spectrum of sine and square signals

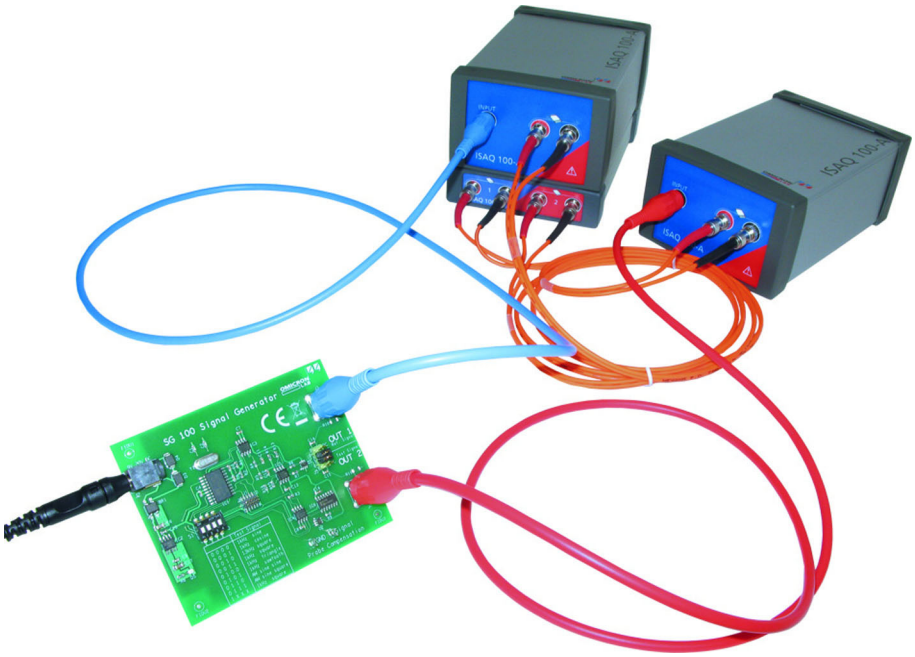
To go through the example, proceed as follows:

1. Assemble the *ISAQ 100* system as described in 2.3 "Connecting the ISAQ 100-A to the ISAQ 100-C" on page 19 and connect the *ISAQ 100-C* to your computer by using the USB cable.
2. Start the *ISAQ Measurement Suite.*
3. Click the **FFT** tab to change to the **FFT** mode, and then select the **CH 1** check box.

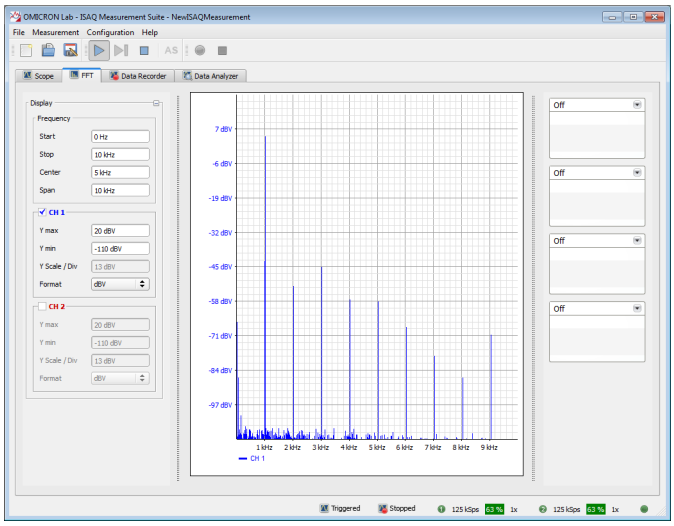


4. Power the *SG 100* signal generator as described in 10 "SG 100 Signal Generator" on page 109.
5. Set the coupling of the **OUT 1** and **OUT 2** outputs of the signal generator to AC by the respective jumpers (see Figure 10-3 "SG 100 signal generator: jumpers for setting the coupling" on page 111).

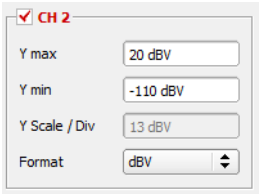
6. Connect the **OUT 1** connector of the *SG 100* signal generator to the **CH 1** input of the *ISAQ 100-A* and the **OUT 2** connector of the *SG 100* signal generator to the **CH 2** input of the *ISAQ 100-A*.



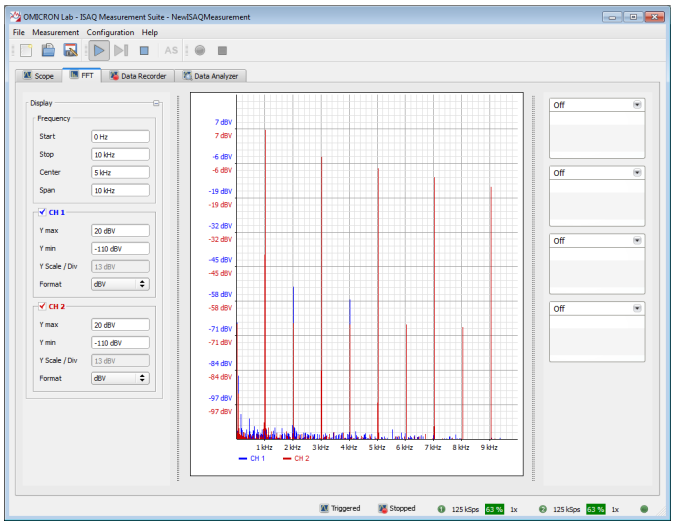
7. In the graphical display, view the signal spectrum. The diagram shows a dominant spectral line at the fundamental frequency and harmonic multiples of the fundamental frequency. The fundamental frequency at 1 kHz is dominant since this is a sine wave signal.



8. Generate a square signal of frequency 1 kHz by setting the switch on the *SG 100* signal generator to (0011) (see Figure 10-4 "SG 100 signal generator: switch for setting the test signal" on page 112).
9. Select the **CH 2** check box.



10. In the graphical display, view the signal spectrum. The diagram shows dominant spectrum lines at the uneven multiples of the fundamental frequency.


OMICRON Lab - ISAQ Measurement Suite - NewISAQMeasurement
File Measurement Configuration Help
Scope FFT Data Recorder Data Analyzer
Display
Frequency
Start 0 Hz
Stop 10 kHz
Center 5 kHz
Span 10 kHz
CH 1
Y max 20 dBV
Y min -110 dBV
Y Scale / Div 13 dBV
Format dBV
CH 2
Y max 20 dBV
Y min -110 dBV
Y Scale / Div 13 dBV
Format dBV
Off
Off
Off
Off
1 kHz 2 kHz 3 kHz 4 kHz 5 kHz 6 kHz 7 kHz 8 kHz 9 kHz
CH 1 CH 2
Triggered Stopped 125 kSps 63 % 1x 125 kSps 63 % 1x

Result: A perfect sine signal has spectrum lines at the fundamental frequency. A perfect square signal has spectrum lines at the uneven multiples of the fundamental frequency. Since the provided signals are real world signals and not 100 percent perfect you can see additional lines at multiples of the fundamental frequency.

Congratulations! You have learned how to:

- Start the **FFT** mode
- Measure the spectrum of sine and square signals

To learn more about using the **FFT** mode, continue with the next example.

4.2.2 Example 2: FFT Settings

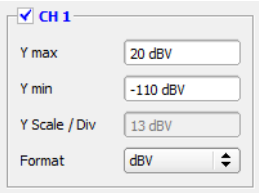
Expected example duration: 15 minutes.

In this example, you will learn how to:

- Set the start and stop frequencies and work with the center frequency and the frequency span
- Work with cursors

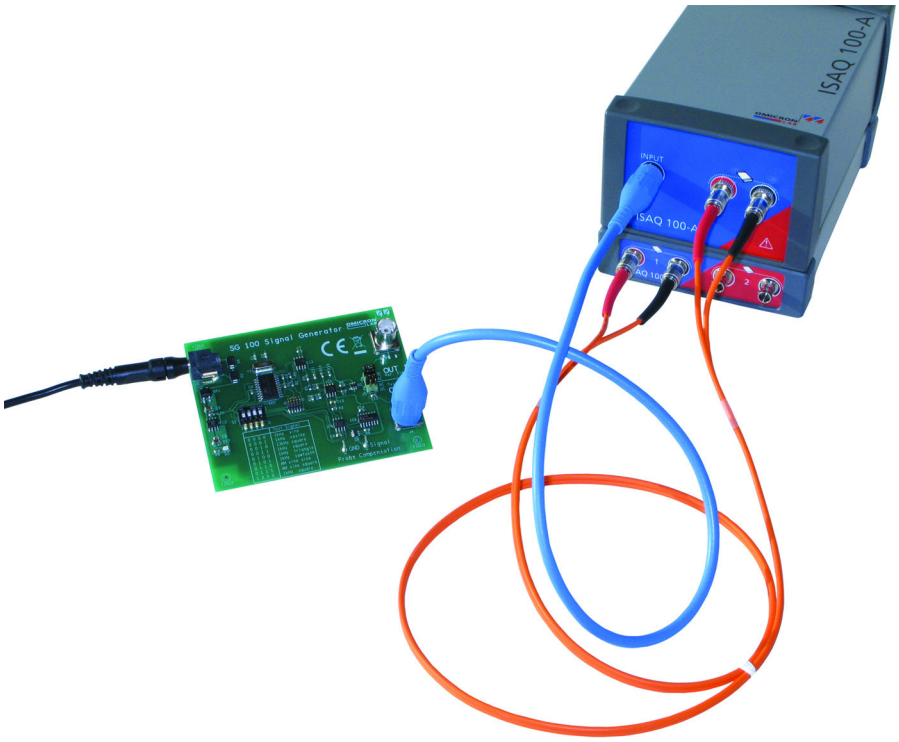
To go through the example, proceed as follows:

1. Assemble the *ISAQ 100* system as described in 2.3 "Connecting the ISAQ 100-A to the ISAQ 100-C" on page 19 and connect the *ISAQ 100-C* to your computer by using the USB cable.
2. Start the *ISAQ Measurement Suite.*
3. Click the **FFT** tab to change to the **FFT** mode, and then select the **CH 1** check box.

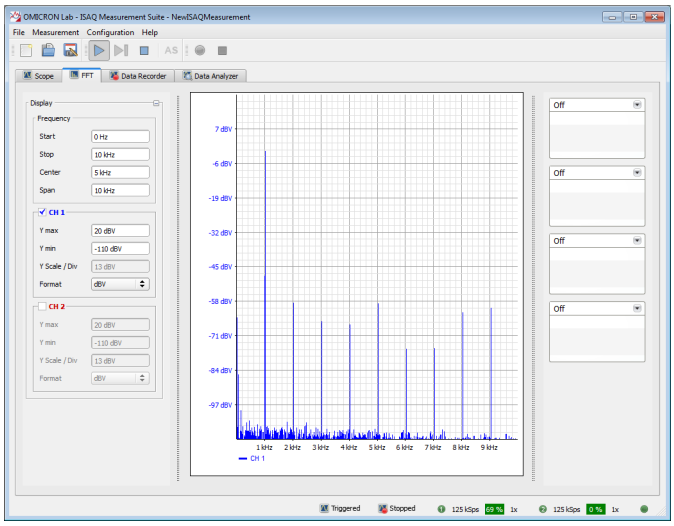


4. Power the *SG 100* signal generator as described in 10 "SG 100 Signal Generator" on page 109.
5. Set the coupling of the **OUT 2** output of the signal generator to AC by the respective jumper (see Figure 10-3 "SG 100 signal generator: jumpers for setting the coupling" on page 111).

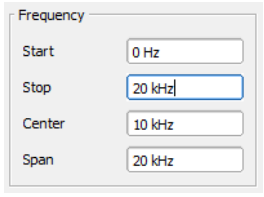
6. Connect the **OUT 2** connector of the *SG 100* signal generator to the **CH 1** input of the *ISAQ 100-A*.



7. Generate an AM sine square signal by setting the switch on the *SG 100* signal generator to (0111) (see Figure 10-4 "SG 100 signal generator: switch for setting the test signal" on page 112).

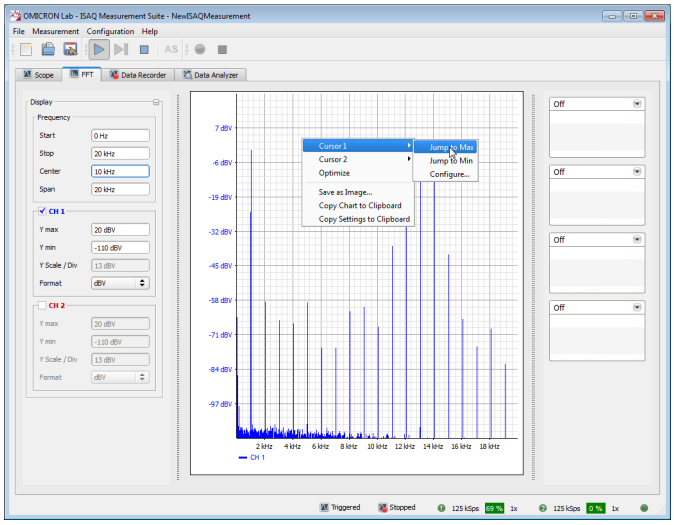


8. In the **FFT** control, change **Stop** to 20 kHz (**Center** and **Span** change automatically).

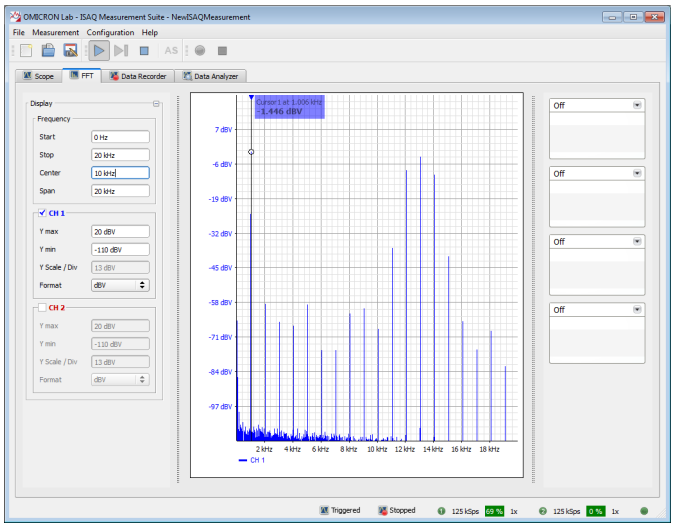


Note: You can use the mouse wheel to quickly adjust the settings.

9. Right-click in the graphical display, point to **Cursor 1**, and then click **Jump to Max**.

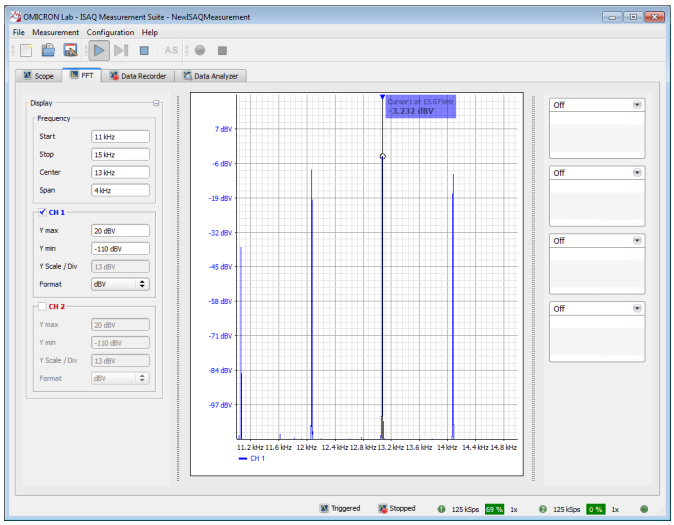


10. The cursor is set to the fundamental signal frequency.



11. In the **FFT** control, set **Center** to 13 kHz and **Span** to 4 kHz.

12. By using the **Jump to Max** command, set the cursor to the frequency of the square signal which is used to modulate the fundamental signal.



Result: According to the cursor reading, the frequency of the square signal is 13.07 kHz.

Note: To check out how the combined signal looks like in the time domain, switch to the **Scope** mode to get an impression of the signal.

Congratulations! You have learned how to:

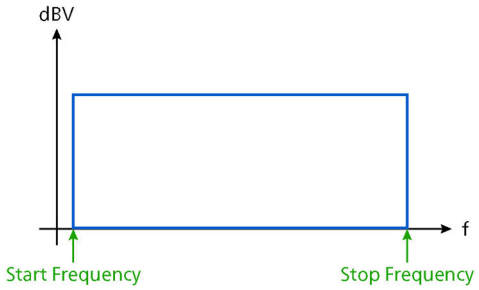
- Set the start and stop frequencies and work with the center frequency and frequency span
- Work with cursors

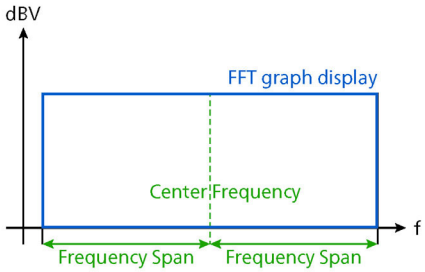
By working through the examples in this chapter, you have learned how to use the **FFT** mode. Refer to the overview chart in 4 "FFT Mode" on page 49 and try different settings to examine their effects on the measurement results.

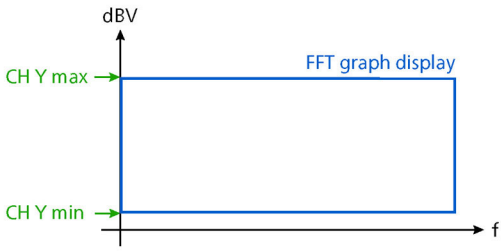
4.3 FFT Control

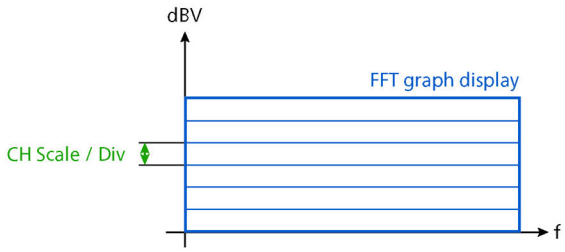
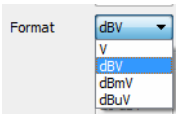
This section describes in detail the **FFT** control (see 4.1.1 "FFT Control" on page 50)

Note: The start frequency, stop frequency, center frequency and frequency span are mutually dependent. After one of them has been changed, the other settings are recalculated by the *ISAQ Measurement Suite*.

Frequency	
Start	Sets the minimum frequency displayed on the x-axis of the **FFT** graphical display.
Stop	Sets the maximum frequency displayed on the x-axis of the **FFT** graphical display. 

Center	Sets the center frequency displayed on the x-axis of the **FFT** graphical display.
Span	Defines the width of the x-axis of the **FFT** graphical display.  **Note:** It is recommended to work with the center frequency and frequency span in applications where the center frequency plays an important role, for example, for measurements of quartz oscillators.

CH 1, CH 2	
Y max	Sets the maximum value displayed on the y-axis of the **FFT** graphical display.
Y min	Sets the minimum value displayed on the y-axis of the **FFT** graphical display. 

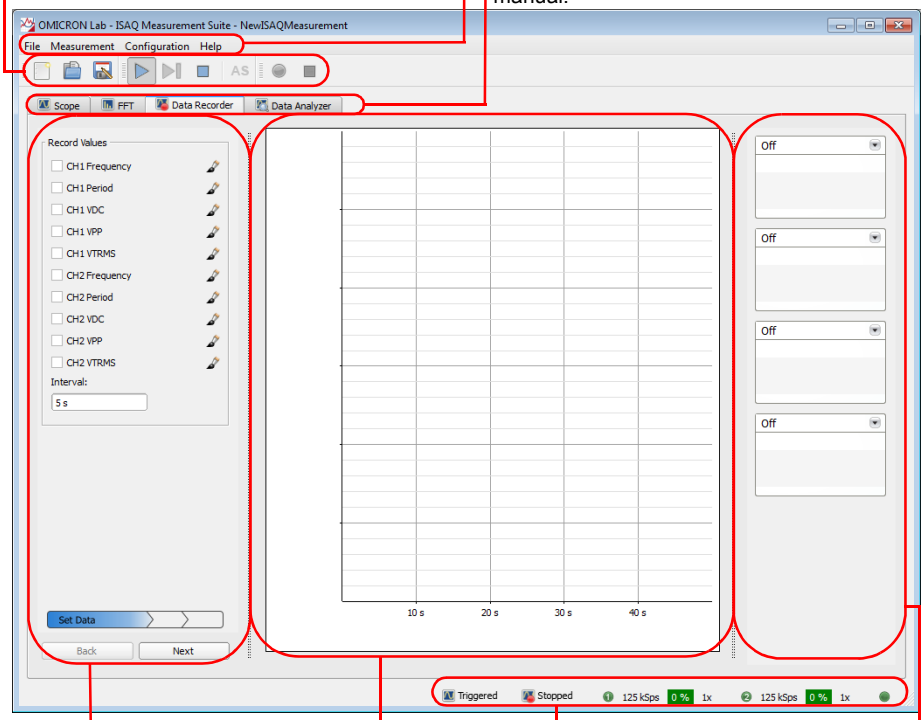
Y Scale/Div	Shows the displayed format entities within a division for the y-axis of the respective channel. 
Format	 Selects the y-axis format of the **FFT** graphical display.

5 Data Recorder Mode

Menu bar
Provides access to all *ISAQ 100* functions. See 7.1 "Menus and Commands" on page 85.

Toolbar
Contains the most important controls. See 5.1.4 "Toolbar" on page 69.

Mode tabs
Enable a quick change between the *ISAQ 100* operating modes. For information about the **Scope** mode, **FFT** mode, and **Data Analyzer** mode refer to the respective chapters of this manual.



Data Recorder wizard
Contains the **Data Recorder** controls. See 5.3 "Data Recorder Wizard" on page 74.

Status bar
Shows the recorder status as well as the signal level, the measurement status, settings and overload. See 7.2 "Status Bar" on page 87.

Recording display
Use the shortcut menu to optimize the display. See 5.1.2 "Recording Display" on page 67.

Result display
Select the result format and get results. See 5.1.3 "Result Display" on page 68.

Figure 5-1 **Data Recorder** mode view

5.1 Overview

This section gives you a short overview on the **Data Recorder** mode view. For a detailed function description, see 5.3 "Data Recorder Wizard" on page 74.

5.1.1 Data Recorder Wizard

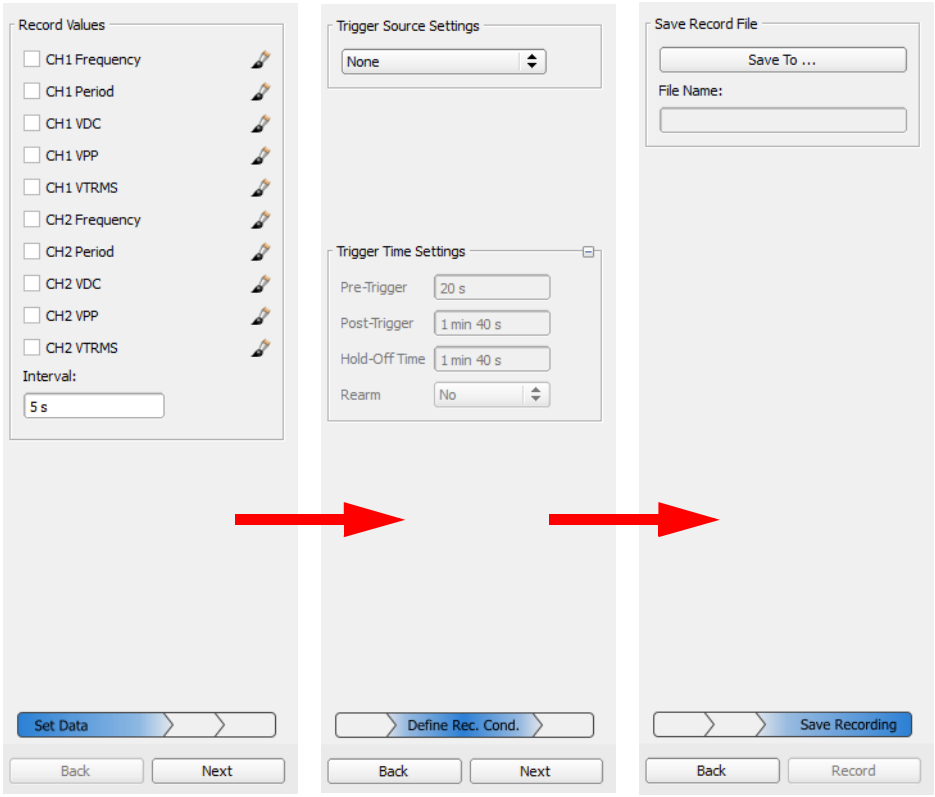


Figure 5-2 **Data Recorder** wizard

5.1.2 Recording Display

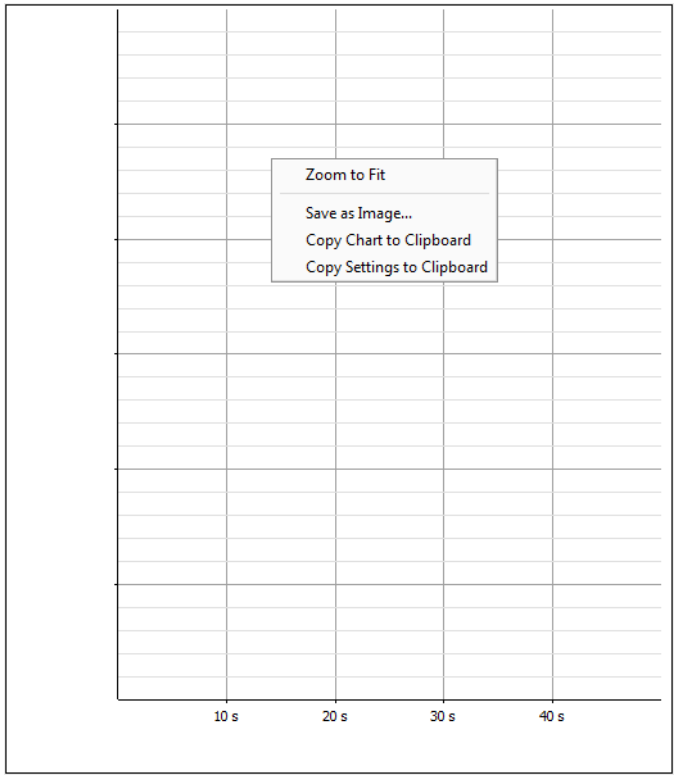


Figure 5-3 Recording display

Right-click in the diagram to open the shortcut menu. Use the shortcut menu to fit the recording display to your needs and export its content and/or settings.

Note: By using the **Copy Chart to Clipboard** and **Copy Settings to Clipboard** functions, you can easily export your diagram into other Windows-based programs. For more information, see 8 "Advanced Display Options" on page 99.

5.1.3 Result Display

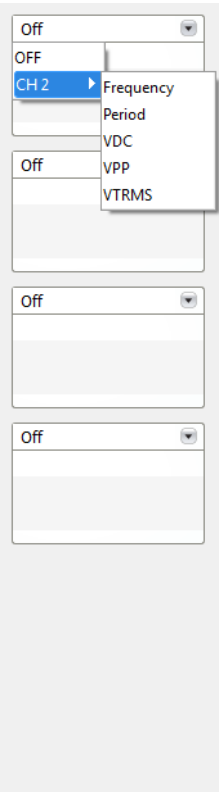


Figure 5-4 Result display

In the result display, you can display the results of mathematical signal values such as VTRMS.

Note: By default, the result displays are set to **Off**. Click the drop-down arrow to open the menu for choosing the result source and format.

5.1.4 Toolbar

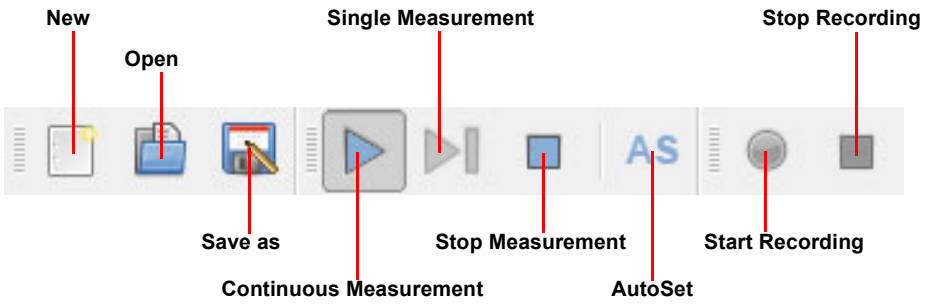


Table 5-1 Toolbar buttons

Button	Description
New	Sets all settings to default values and the filename to NewISAQMeasurement.dat.
Open	Opens Windows Explorer to browse to the .setting file you want to open.
Save as	Opens Windows Explorer to browse to the location you want to save the .setting and .dat files.
Start Recording[1]	Starts data recording. Starts a continuous measurement (**Scope**/**FFT** mode) if a measurement has been stopped. If you press the **Stop Measurement** button (**Scope**/**FFT** mode), the data recording is stopped as well.
Stop Recording	Stops the data recording.

1. The **Start Recording** button is activated as soon as a measurement was defined by the **Data Recorder** wizard. The **Stop Recording** button is activated as soon as the recording was started.

The toolbar buttons of the **Scope** mode and the **FFT** mode (see 3.1.4 "Toolbar" on page 29) are also available in the **Data Recorder** mode. During the recording, the **Scope** mode and the **FFT** mode run automatically, thus enabling you to switch to those modes for the analysis of the currently recording signal on the fly.

5.2 Example

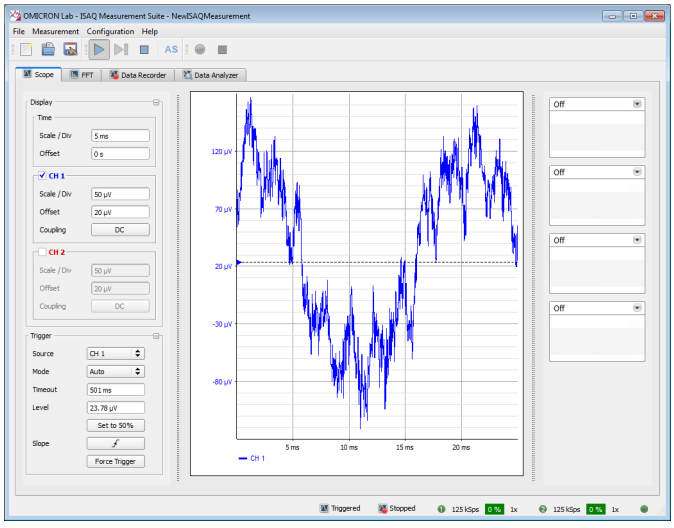
By working through the example in this section, you will learn step by step how to use the **Data Recorder** mode of the *ISAQ 100* system.

Expected example duration: 15 minutes.

In this example, you will learn how to measure and record the signal frequency over time.

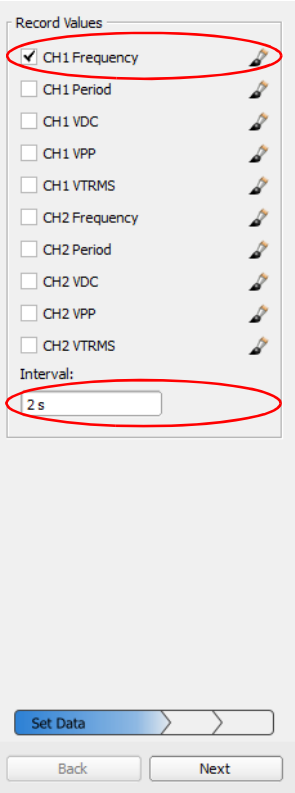
To go through the example, proceed as follows:

1. Assemble the *ISAQ 100* system as described in 2.3 "Connecting the ISAQ 100-A to the ISAQ 100-C" on page 19 and connect the *ISAQ 100-C* to your computer by using the USB cable.
2. Start the *ISAQ Measurement Suite.*
3. Ensure that no cable is connected to the **CH 1** input of the *ISAQ 100-A*.
4. In the **Scope** mode, click the **AutoSet** toolbar button AS.
5. Depending on your line frequency the graphical display shows a voltage versus time diagram which may slightly differ from the following figure.



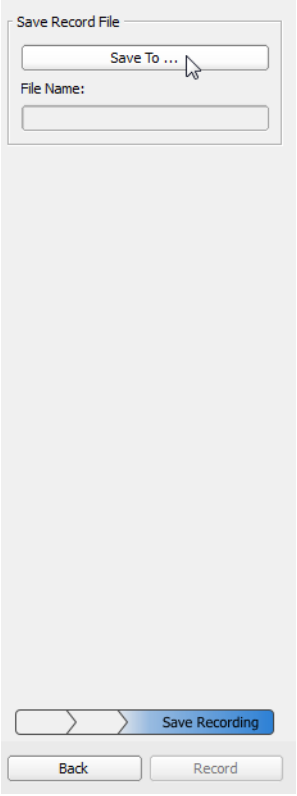
6. To record the displayed signal, click the **Data Recorder** tab and follow the next steps.

7. In the **Data Recorder** wizard, select the **CH1 Frequency** check box and set the recording interval to 2 s.

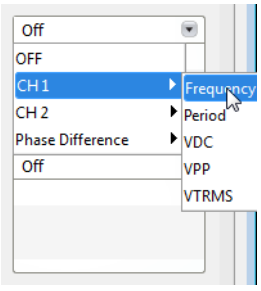


8. Click **Next** to set the recorder trigger settings. In this example we do not need any trigger because we will start the recording manually.
9. Click **Next** once more.

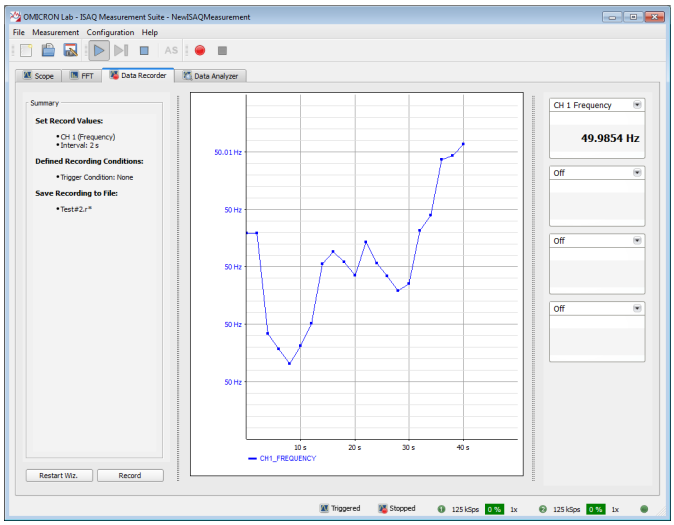
10. In the **Data Recorder** wizard, click the **Save To** button, and then browse to the location you want to save the record file.



11. Click **Record** in the **Data Recorder** wizard or the **Start Recording** toolbar button to start recording.
12. In the result display, click the drop-down arrow, point to **CH 1**, and then click **Frequency**.



13. To display the acquired data, right-click in the graphical display, and then click **Zoom to Fit**.



14. Click **Stop** in the **Data Recorder** wizard or the **Stop Recording** toolbar button ■ to stop recording.

Congratulations! You have learned how to measure and record the signal frequency over time.

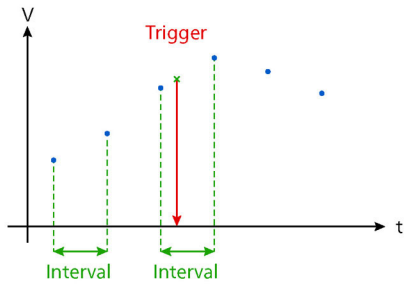
By working through the example in this chapter, you have learned how to use the **Data Recorder** mode. Refer to the overview chart in 5 "Data Recorder Mode" on page 65 and try different settings to examine their effects on the measurement results.

To learn how to analyze the recorded data, continue with the **Data Analyzer** example 6.2 on page 83.

5.3 Data Recorder Wizard

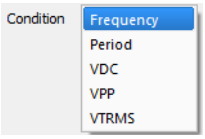
This section describes in detail the **Data Recorder** wizard (see Figure 5-2 "Data Recorder wizard" on page 66). To proceed with the wizard:

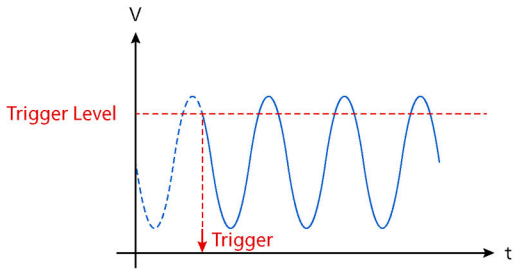
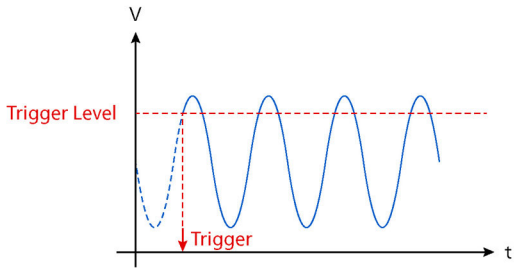
1. Select the detected signals you want to record and the recording interval.

Record Values	
Click the respective check box to select the detected signals to be recorded. Click the brush symbol next to the check box to change the trace color of the selected signal.	
Interval	Defines the time between two measurement points. 

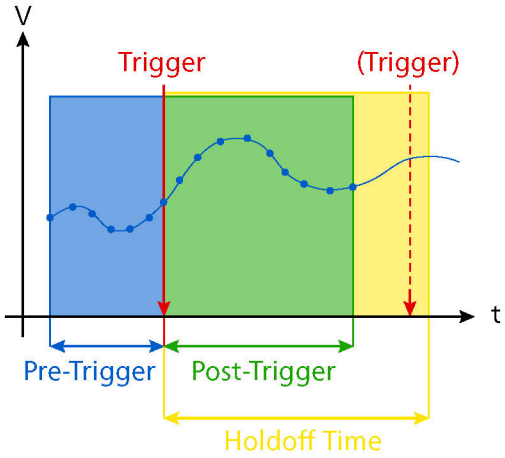
2. Click **Next**.
3. Under **Trigger Source Settings**, select the trigger source and set the trigger conditions.

Trigger Source Settings	
CH 1	Signal of the *ISAQ 100-A* connected as channel 1 to the *ISAQ 100-C*
CH 2	Signal of the *ISAQ 100-A* connected as channel 2 to the *ISAQ 100-C*
External	TTL trigger input of the *ISAQ 100-C*
Line	The built-in light-sensitive sensor of the *ISAQ 100-C*. The sensor uses the light emission from AC operated light bulbs.

Condition	For the **CH 1** and **CH 2** trigger sources, you can set the following trigger conditions: 

Level	Defines the trigger level of the selected condition and, consequently, when the recording starts.  **Note: Trigger Level** is only available if **CH 1** or **CH 2** has been selected as trigger source.
Slope	The **Trigger Slope** button showing a rising slope indicates that the trigger occurs when the trigger signal passes the trigger level by a rising slope. The **Trigger Slope** button showing a falling slope indicates that the trigger occurs when the trigger signal passes the trigger level by a falling slope. The following figure shows when the recording would start if **Trigger Slope** was set a rising slope.  **Note: Slope** is only available if **CH 1**, **CH 2**, or **External** has been selected as trigger source.

4. Under **Trigger Time Settings**, select the trigger parameters visualized in the following figure.



Trigger Time Settings	
Pre-Trigger	Defines the time frame in front of the trigger event for which the measurement points are kept and visualized for the recording.
Post-Trigger	Defines the time of recording. This time starts to count with the trigger event.
Hold-Off Time[1]	Defines the time after the last trigger in which all other fulfilled trigger conditions are ignored.
Rearm	Automatically resets the recording.

1. Must be ≥ **Post-Trigger**.

5. Click **Next**.
6. Under **Save Record File**, specify the file name where the data is saved to.

Save Record File	
Save To	Opens Windows Explorer to browse to the location you want to save the .rec file in
File Name	Name of the .rec file.

Note: The *ISAQ Measurement Suite* automatically labels the files to make possible splitting of a measurement into several files, if necessary. For example, for a file name Measurement, the first measurement file is Measurement.rec. If you have activated the rearm parameter, the measurement is repeated and the next file names are Measurement.r02, Measurement.r03,…. Additionally, when a measurement is started, a settings file containing all program settings is saved into the same directory. In this example, the name of the settings file is Measurement.setting.

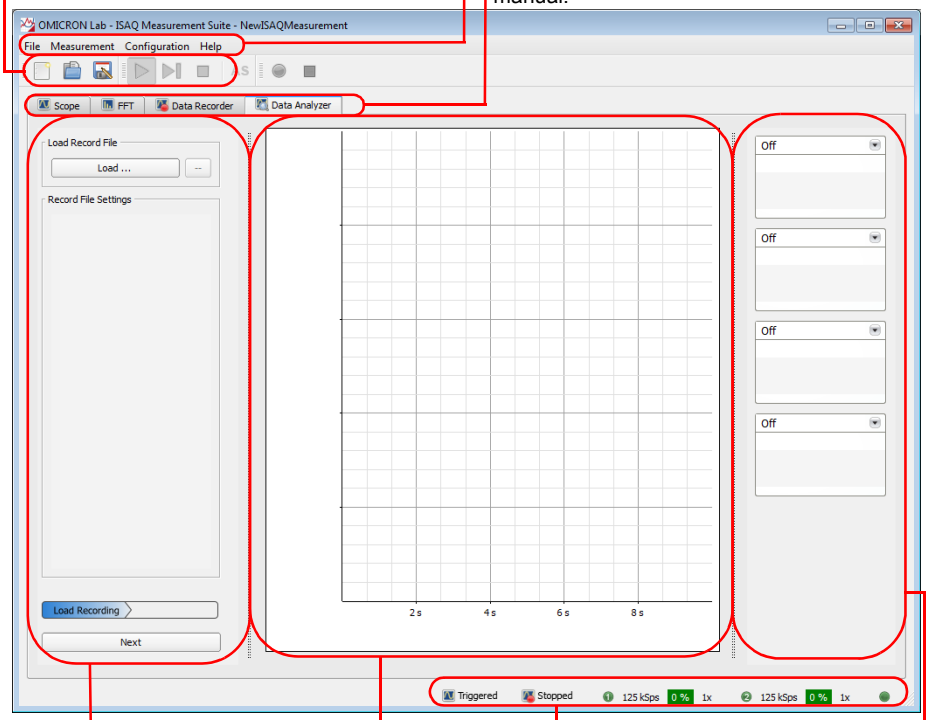
Note: Each time a recording is started, the *ISAQ Measurement Suite* searches for all file names matching the naming scheme mentioned earlier in this section. All files with the file name selected for recording in the same directory are deleted when recording starts.

6 Data Analyzer Mode

Menu bar
Provides access to all *ISAQ 100* functions. See 7.1 "Menus and Commands" on page 85.

Toolbar
Contains the most important controls. See 5.1.4 "Toolbar" on page 69.

Mode tabs
Enable a quick change between the *ISAQ 100* operating modes. For information about the **Scope** mode, **FFT** mode, and **Data Recorder** mode refer to the respective chapters of this manual.



Data Analyzer wizard
Contains the **Data Analyzer** controls. See 6.3 "Data Analyzer Wizard" on page 84.

Status bar
Shows the condition of the acquisition units connected. See 7.2 "Status Bar" on page 87.

Analyzer display
Use the shortcut menu to optimize the display. See 6.1.2 "Analyzer Display" on page 81.

Result display
Select the result format and get results. See 6.1.3 "Result Display" on page 82.

Figure 6-1 **Data Analyzer** mode view

6.1 Overview

This section gives you a short overview on the **Data Analyzer** mode view. For a detailed function description, see 6.3 "Data Analyzer Wizard" on page 84.

6.1.1 Data Analyzer Wizard

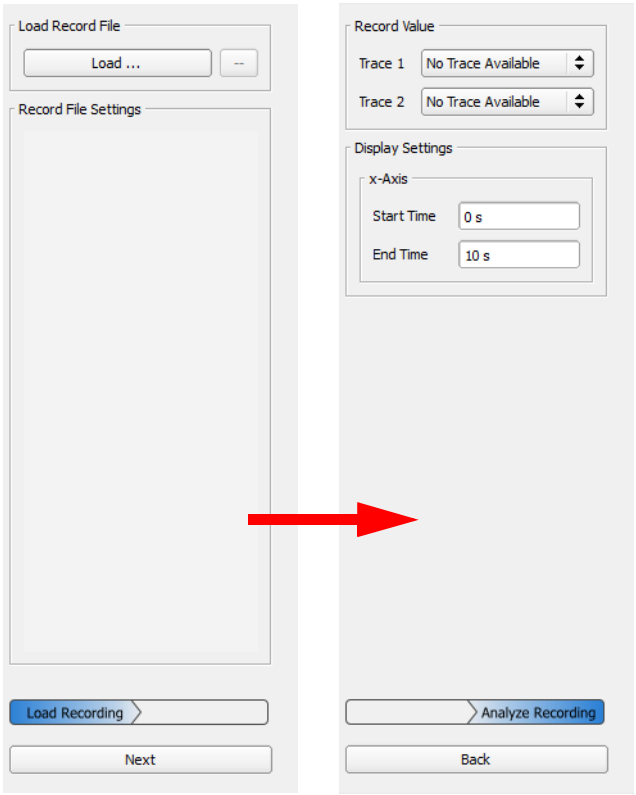


Figure 6-2 **Data Analyzer** wizard

6.1.2 Analyzer Display

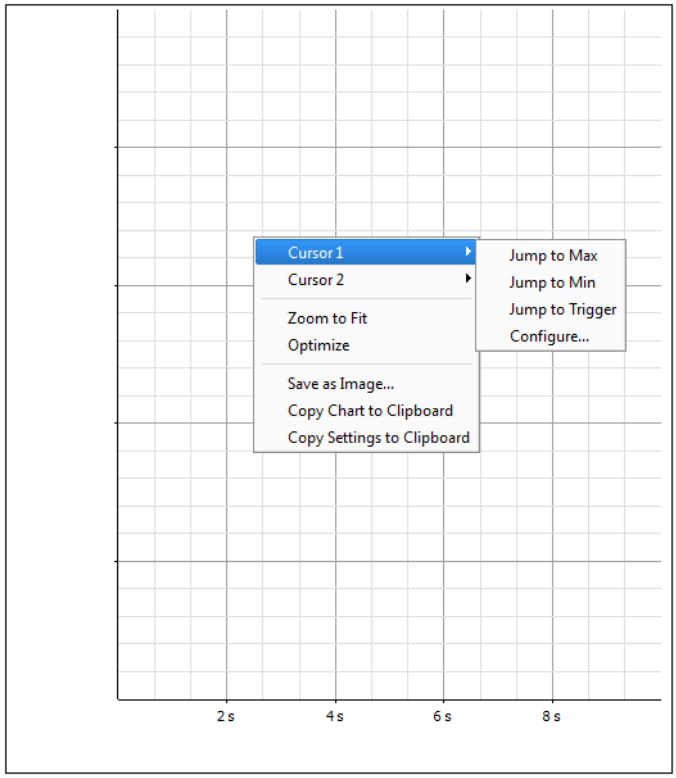


Figure 6-3 Analyzer display

Right-click in the diagram to open the shortcut menu. Use the shortcut menu to fit the analyzer display to your needs and export its content and/or settings.

Note: By using the **Copy Chart to Clipboard** and **Copy Settings to Clipboard** functions, you can easily export your diagram into other Windows-based programs. For more information, see 8 "Advanced Display Options" on page 99.

6.1.3 Result Display

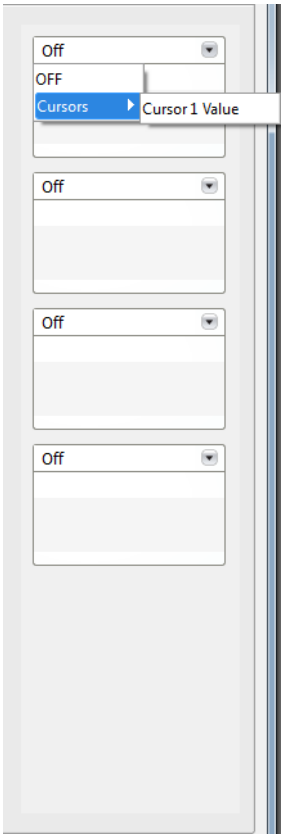


Figure 6-4 Result display

In the result display, you can display the results of mathematical signal values such as VTRMS.

Note: By default, the result displays are set to **Off**. Click the drop-down arrow to open the menu for choosing the result source and format. The selections will be available as soon as a data record has been loaded.

6.1.4 Toolbar

For the toolbar, see 5.1.4 "Toolbar" on page 69.

6.2 Example

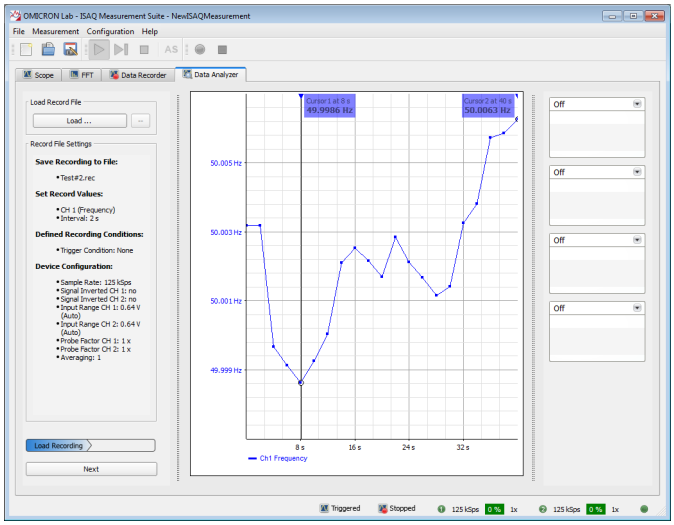
By working through the example in this section, you will learn step by step how to use the **Data Analyzer** mode of the *ISAQ 100* system.

Expected example duration: 10 minutes.

In this example, you will learn how to analyze the data recorded in the **Data Recorder** mode.

To go through the example, proceed as follows:

1. Start the *ISAQ Measurement Suite.*
2. Click the **Data Analyzer** tab.
3. In the **Data Analyzer** wizard, click the **Load** button, and then browse to the .rec file saved in the **Data Recorder** example 5.2 on page 70.
4. To display the acquired data, right-click in the graphical display, and then click **Optimize**. By clicking the next button in the **Data Analyzer** wizard you will be able to adjust the displayed curve section as needed.
5. Set the cursors to the minimum and maximum of the recorded data (see 8 "Advanced Display Options" on page 99).



The diagram shows the change of the line frequency over time.

Congratulations! You have learned how to analyze the data recorded in the **Data Recorder** mode.

By working through the example in this chapter, you have learned how to use the **Data Analyzer** mode. Refer to the overview chart in 6 "Data Analyzer Mode" on page 79 and try different settings to examine their effects on the measurement results.

6.3 Data Analyzer Wizard

This section describes in detail the **Data Analyzer** wizard (see Figure 6-2 "Data Analyzer wizard" on page 80). To proceed with the wizard:

1. Under **Load Record File**, click **Load**, and then browse to the .rec file you want to load.
   Under **Record File Settings**, all relevant settings of the loaded file are displayed.
2. Click **Next**.
3. Under **Record Value**, select the signal you want to analyze and assign it to a trace.

Record Value	
Trace 1	Assigns a signal to the trace 1.
Trace 2	Assigns a signal to the trace 2.

4. Under **Display Settings**, set the display position and dimension.

Display Settings	
Start Time	Defines the start point of the x-axis on the analyzer display.
End Time	Defines the end point of the x-axis on the analyzer display.
Y max	Defines the end point of the y-axis for the selected trace on the analyzer display.
Y min	Defines the start point of the y-axis for the selected trace on the analyzer display.

7 Common Functions

In this section you can find the *ISAQ Measurement Suite* basics. The section provides an overview of the menus, commands, and status bar common to all operating modes. Further on, this section explains how to change the measurement range, how to select the measurement speed, how to export the data, and how to store and load configuration files.

7.1 Menus and Commands

Table 7-1 **File** Menu

Command	Description
New	Sets all settings to default values and the filename to NewISAQMeasurement.dat.
Open	Opens Windows Explorer to browse to the .setting file you want to open.
Save	Opens Windows Explorer to browse to the location you want to save .setting and .dat files.
Save as	Opens Windows Explorer to browse to the location you want to save .setting and .dat files.
CSV Export	Exports the measurement data into a comma separated value .csv file. For detailed information see 7.4 "Exporting Measurement Data" on page 88.
Exit	Exits the *ISAQ Measurement Suite*.

Table 7-2 **Measurement** Menu

Command	Description
Continuous Measurement	Starts a periodically repeated measurement.
Single Measurement	Starts a single measurement.[1]
Stop Measurement	Stops a measurement. The last result remains displayed. Stops the recording if data recording is running.
AutoSet	Finds the range within which the signal falls and sets a default trigger point.
Start Recording	Starts data recording. Starts a continuous measurement (**Scope**/**FFT** mode) if a measurement has been stopped.
Stop Recording	Stops the data recording.

1. Limited to max. 1 s.

Table 7-3 **Configuration** Menu

Command	Description
Device Configuration	Opens the **Device Configuration** window for setting the device configuration and connection of the *ISAQ 100* system. For detailed information see 7.5 "Device Configuration" on page 89.
Settings	Opens the **General Settings** window for setting the *ISAQ 100* system and the *ISAQ Measurement Suite* options. For detailed information see 7.6 "Settings" on page 92.

Table 7-4 **Help** Menu

Command	Description
Status Logger	Displays the status messages of the current measurement session.
About	Displays the *ISAQ Measurement Suite* version.

7.2 Status Bar

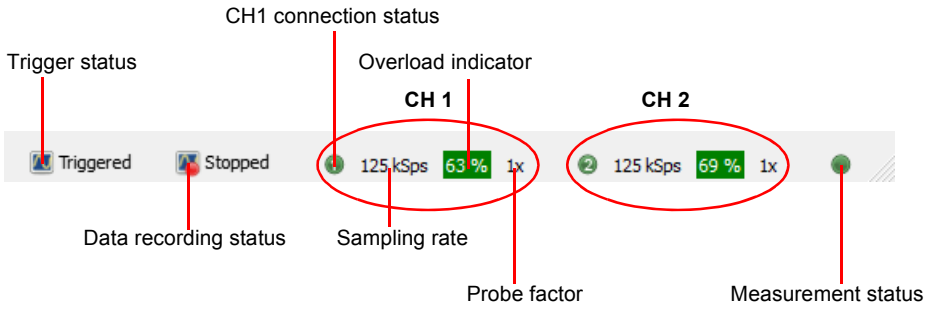


Figure 7-1 Status bar

Note: If the connection status shows the channel identification, for example, **1** on a red background, the indicated channel is not connected or cannot be detected.

Note: You can change the probe factor and the sampling rate in the **Device Configuration** window (see 7.5 "Device Configuration" on page 89).

Caution: If the overload indicators for the CH 1 and CH 2 inputs show a red bar, increase the input range of the respective channel in the **Device Configuration** window (see 7.5 "Device Configuration" on page 89) or reduce the source signal to prevent an overload.

Note: The measurement status signals the status of the overall measurement system. A green light signals that the status is OK. If a red light lights, (status is Not OK), check the status logger (see Table 7-8 "Global Suite Options" on page 96) or the log file for more information. The measurement status is Not OK mainly if the computer cannot process the data amount provided by the *ISAQ 100* system.

7.3 Loading and Saving the Equipment Configuration

You can save all settings of the *ISAQ 100* system including the device configuration, measurement settings, measurement data and recorded data as well as the display settings in a .setting file by clicking the **Save as** toolbar button (see Table 7-1 "File Menu" on page 85).

You can save multiple equipment configurations for repetitive measurements tasks. With the equipment configurations saved, you can load the respective files for each measurement instead of setting the *ISAQ 100* system manually.

Note: You can set the default path for saving .setting and .dat files in the **General Settings** window (see 7.6 "Settings" on page 92).

The file containing the *ISAQ 100* system settings has the .setting extension. The files are stored in ini file format as key-value pairs and can be viewed with standard Web browsers or text editors.

To load Scope or FFT data, open a .setting file (the corresponding .dat file, if existing, will be loaded automatically) so that the measurement data is displayed. To preserve these values, the measurement is stopped automatically when the files are loaded. In this state you can change display options and use cursors to read the measurement data. To start a measurement with the loaded configuration and settings, click the **Continuous Measurement** toolbar button .

Note: You can start the *ISAQ 100* system with the same configuration as in your last session (see 7.6 "Settings" on page 92).

7.4 Exporting Measurement Data

In the **Scope** and **FFT** operating modes, you can export the measurement data and all equipment settings by clicking **CSV Export** in the **File** menu (see Table 7-1 "File Menu" on page 85) into a comma separated value .csv file. This file format can be easily processed by standard spreadsheet analysis tools such as Microsoft Excel. The data is exported into two separate files: a .v.csv (scope data) and a .fft.csv (fft data), the used value-format is indicated in the header.

Note: To adapt the .csv file to your needs, you can select different decimal and value separators (see 7.6 "Settings" on page 92).

7.5 Device Configuration

In the **Device Configuration** window, you can check the configuration and connection of the *ISAQ 100* system. To open the **Device Configuration** window, click **Device Configuration** on the **Configuration** menu.

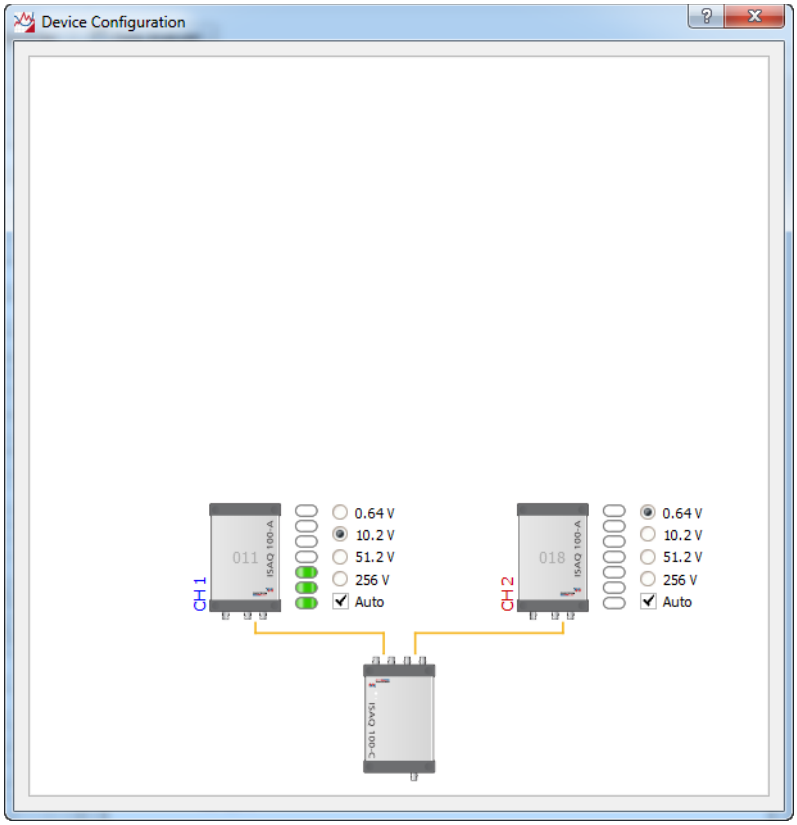


Figure 7-2 **Device Configuration** window

The **Device Configuration** window shows the currently connected devices. The current signal input level and the selected input range of the *ISAQ 100-A* is displayed next to the device symbol.

You can click the device symbols to display the corresponding device information. The following figure shows the device information window of the *ISAQ 100-A*.

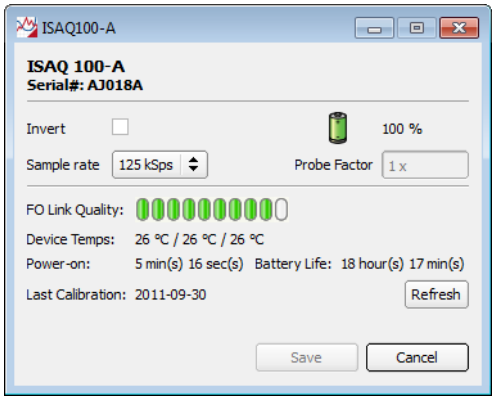


Figure 7-3 **ISAQ 100-A** device information window

Table 7-5 *ISAQ 100-A* Device Information

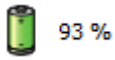
Data	Description
Serial#	Serial number of the *ISAQ 100-A*
Invert	Select the **Invert** check box to invert the signal acquired by the *ISAQ 100-A*.
Sample rate	Sample rate of the signal at the *ISAQ 100-A* input
 93 %	Shows the energy status of the batteries in the *ISAQ 100-A*. If required, change the batteries as described in 9 "Changing the Batteries of the ISAQ 100-A" on page 105.
Probe	Attenuation factor of the probe connected to the *ISAQ 100-A* (Probes are not included in the package.)
FO link	Strength of the signal transmitted from the *ISAQ 100-A* to the *ISAQ 100-C* through the fiber optic cable **Note:** One bar indicates enough signal strength for a fault-free communication.

Table 7-5 *ISAQ 100-A* Device Information (continued)

Data	Description
Temps	Minimum measured device temperature/ current measured device temperature / maximum measured device temperature
Power-on	Time the *ISAQ 100-A* has been operating
Battery Life	Time since the last battery replacement
Calibration	Date of the *ISAQ 100-A* last factory calibration

The following figure shows the device information window for the *ISAQ 100-C*.

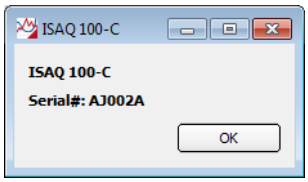


Figure 7-4 **ISAQ 100-C** device information window

7.6 Settings

In the **General Settings** window, you can set settings for measurement modes, device settings, global suite options, and data export settings. To open the **General Settings** window, click **Settings** on the **Configuration** menu.

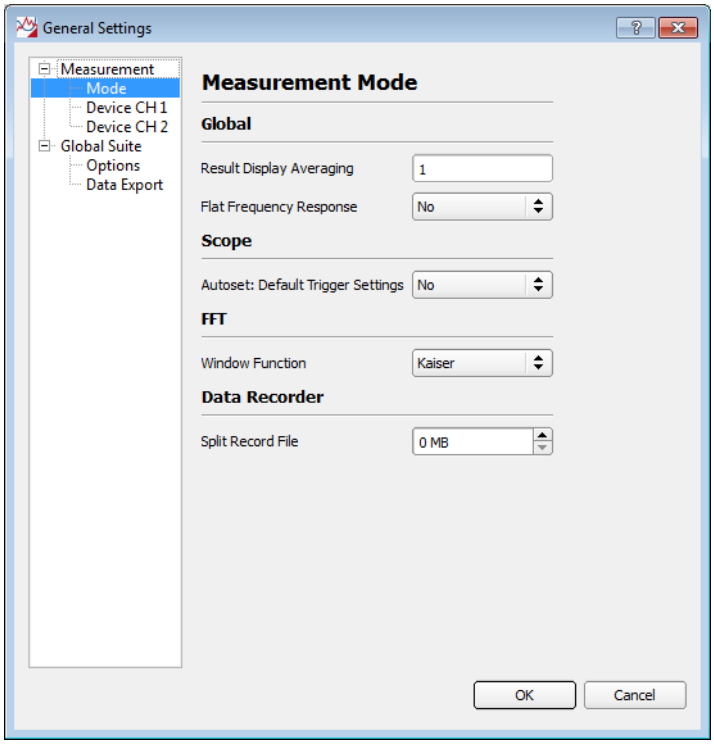


Figure 7-5 **General Settings** window: measurement mode settings

Note: The settings made in the **General Settings** window affect all measurements.

Table 7-6 Measurement Mode Settings

Setting	Description
Global	
Result Display Averaging	Number of adjacent values used to average the measurement results
Flat Frequency Response	**NO**: The filter is optimized for measurements in the time domain. **YES**: The filter is optimized for measurements in the frequency domain.
Scope	
Autoset: Default Trigger Settings	If set to **YES**, the trigger settings are set to default values when **AutoSet** is used. If set to **NO**, the trigger source and slope stay as selected and only the level changes according to the current signal when **AutoSet** is used.
FFT	
Window Function	Selects the filter window used for the FFT calculation.

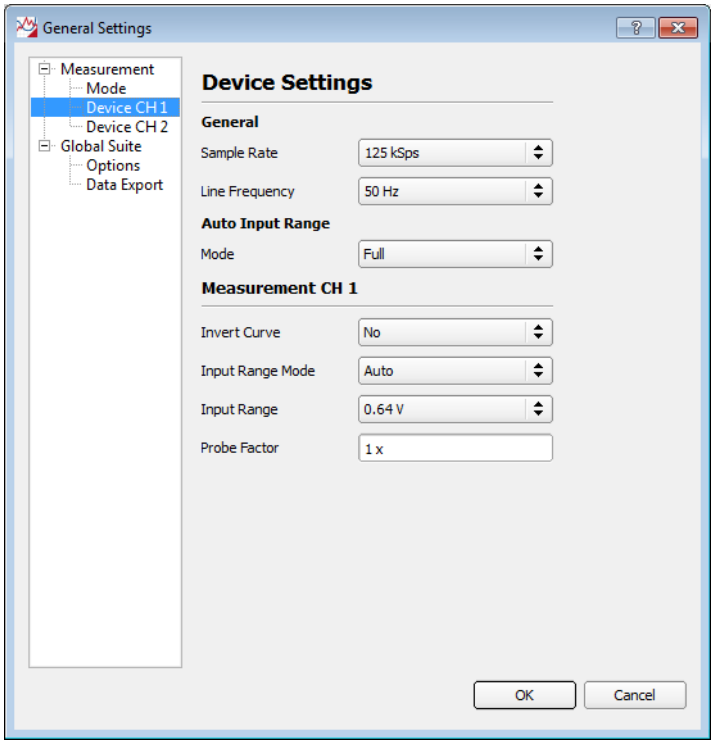


Figure 7-6 **General Settings** window: device settings.

Table 7-7 Device Settings

Setting	Description
General	
Sample Rate[1]	Sample rate of the *ISAQ 100-A* for CH1 and CH2
Line Frequency	Frequency of your power line (50 Hz or 60 Hz). Only used for the line trigger detection.
Auto Input Range	
Mode[2]	Sets automatically adjusted measurement input range. For more information, see "Auto Input Range Mode" later in this section.

Table 7-7 Device Settings (continued)

Setting	Description
Measurement CH 1, CH 2	
Invert Curve	Displays the inverted signal currently measured at the input of the *ISAQ 100-A*.
Input Range Mode	**Auto** or **Manual**. For more information, see "Input Range Mode" later in this section.
Input Range	Input range of the corresponding channel if **Input Range Mode** is set to **Manual**.
Probe Factor	Attenuation factor of the probe connected to the *ISAQ 100-A* (Probes are not part of the delivery content.)

1. Can also be set in the **Device Configuration** window as described in 7.5 "Device Configuration" on page 89.
2. Only active when **Input Range Mode** is set to **Auto** (see **Input Range Mode** later in the table).

Auto Input Range Mode

If **Full** is selected, the optimal input range is used for receiving the signal. The input range is adjusted to the best sensitivity at which the input signal does not oversteer.

If **Semi** is selected, the input range is adapted so that the input signal does not oversteer. Compared with the **Full** setting, with this setting the input range does not adapt when the signal gets lower again.

Input Range Mode

If **Auto** is selected, input range is adjusted automatically.

If **Manual** is selected, the input range is set by **Input Range**.

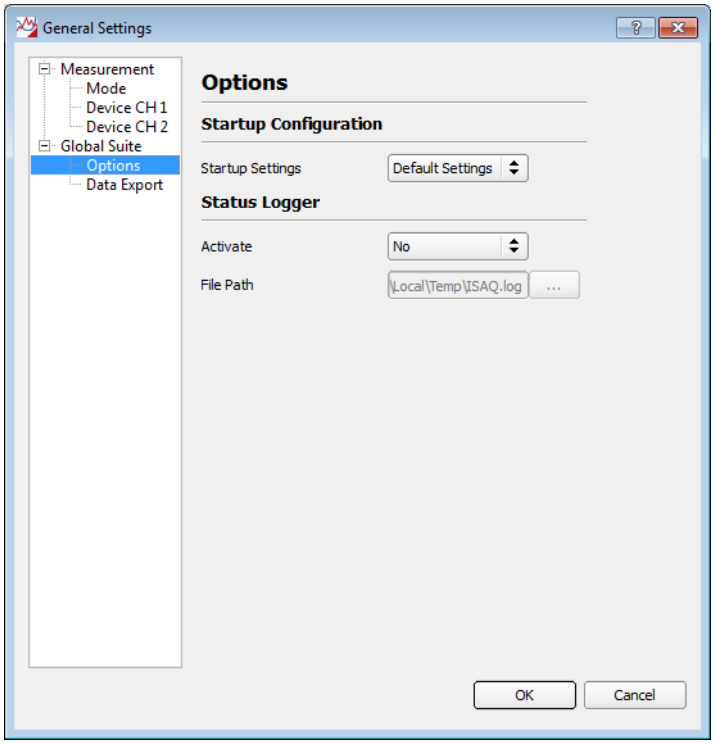


Figure 7-7 **General Settings** window: global suite options

Table 7-8 Global Suite Options

Option	Description
Startup Configuration	
Startup Settings	Specifies the settings the measurement modes come up with. If **Default Settings** is selected, the measurement modes come up with the default settings from the manufacturer. If **Last Session** is selected, the measurement modes come up with the settings from the last measurement session.
Status Logger	
Activate	Specifies whether the status logger is active for logging to file.
File Path	Sets the path to save the log file.

Note: The status logger records the status of the devices during the measurements. The log file might be helpful for technical support analysis when required.

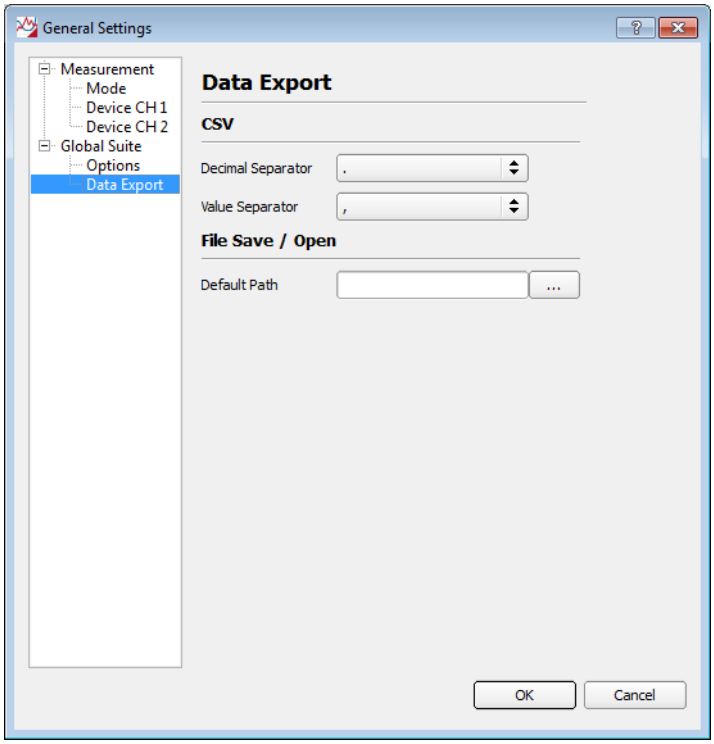


Figure 7-8 **General Settings** window: data export settings

Table 7-9 Data Export Settings

Setting	Description
CSV	
Decimal Separator	Specifies the decimal separator of .csv files.
Value Separator	Specifies the value separator of .csv files.
File Save / Open	
Default Path	Sets the default path to save/open .setting and .dat files.

8 Advanced Display Options

The *ISAQ Measurement Suite* provides several possibilities to visualize the measurement results according to your needs. You can control these advanced display options through the shortcut menus as described in this chapter.

Jump to Max, Jump to Min

By using the **Jump to Max** and **Jump to Min** commands, you can set a cursor to the minimum and the maximum of the measured results as follows:

1. Right-click a curve in the diagram.
2. Point to **Cursor 1** or **Cursor 2**, and then click **Jump to Max** or **Jump to Min** to set the respective cursor to the maximum or the minimum of the curve.

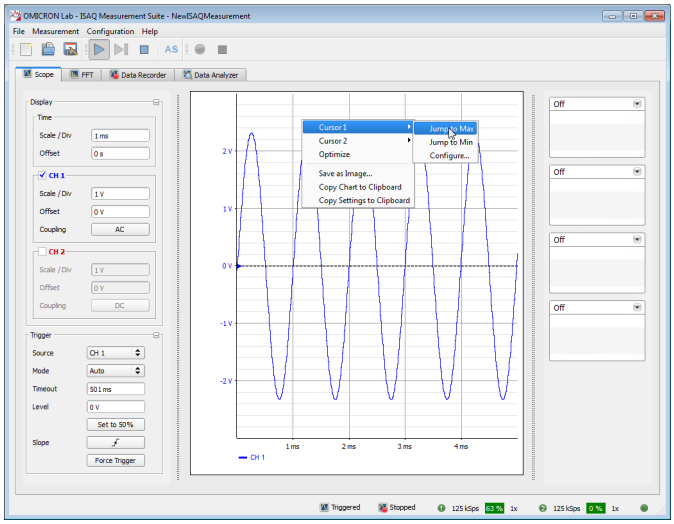


Figure 8-1 Setting the cursor 1 to maximum

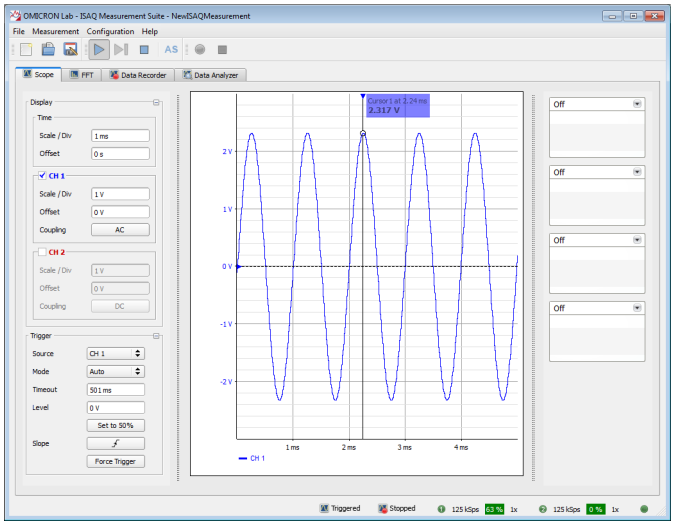


Figure 8-2 Diagram after applying **Jump to Max**

Optimize

With the **Optimize** command, you can optimize diagrams by scaling the y-axis to display the complete diagram in the highest possible resolution. The x-axis stays unchanged.

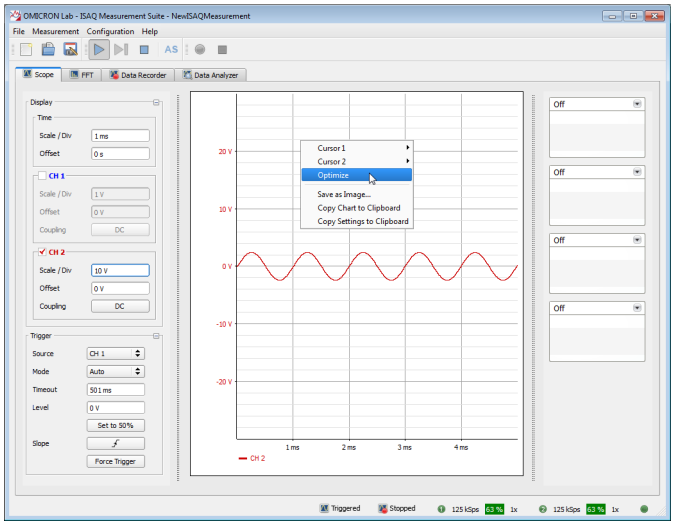


Figure 8-3 Diagram with predefined settings

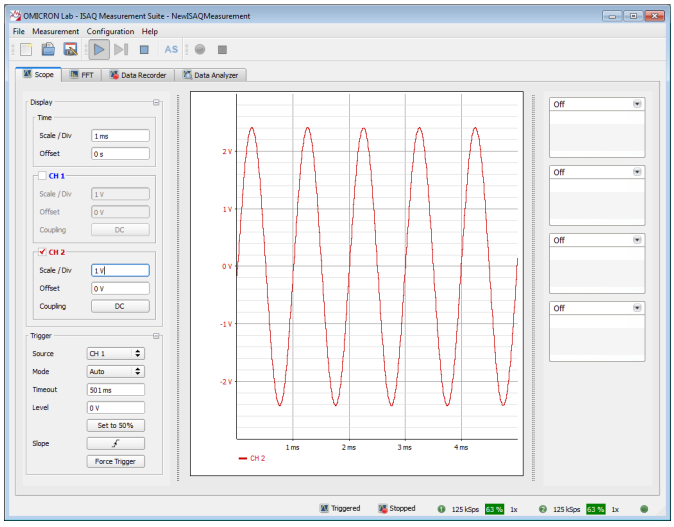


Figure 8-4 Diagram after applying **Optimize**

Save as Image

With the **Save as Image** command, you can save a diagram in the graphical display in a graphical format. The supported file formats are BMP (default) and PNG (if extension is added).

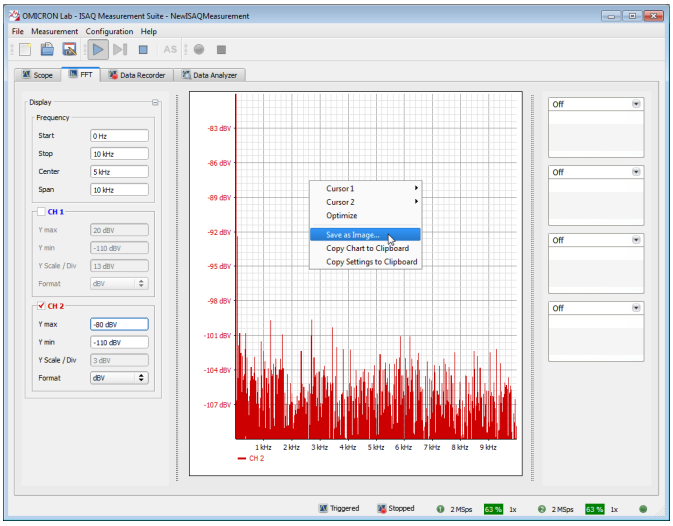


Figure 8-5 Saving a diagram as image

Copy Chart to Clipboard

With the **Copy Chart to Clipboard** command, you can copy a diagram from the graphical display to clipboard. After then, you can insert the diagram into all Windows programs which support the insertion of graphical clipboard content.

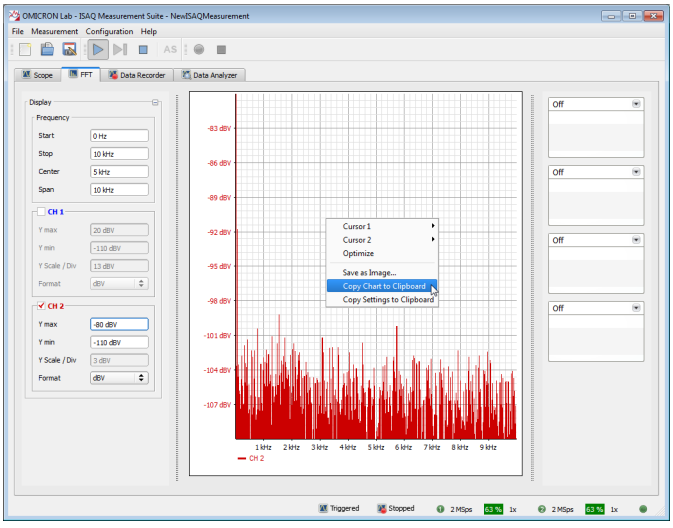


Figure 8-6 Copying a diagram to clipboard

Copy Settings to Clipboard

With the **Copy Settings to Clipboard** command, you can copy all relevant diagram settings to the clipboard. From there you can import the data into all text editing Windows programs, for example, Microsoft Notepad and Microsoft Word.

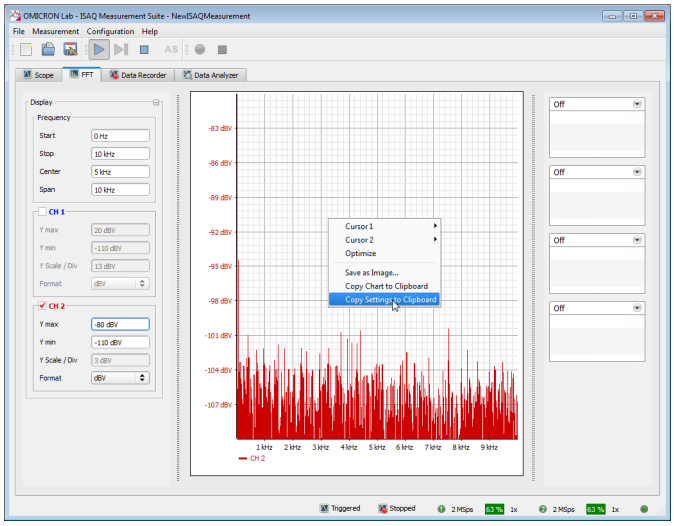


Figure 8-7 Copying a diagram settings to clipboard

Zoom to Fit

With the **Zoom to Fit** command, you can optimize diagrams by scaling the y-axis to display the complete diagram in the highest possible resolution. The x-axis is set from 0 to the next free decade.

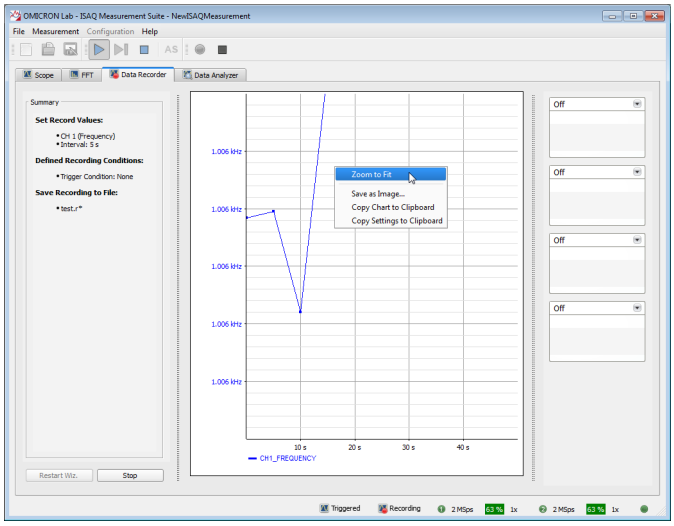


Figure 8-8 Fitting the diagram to the graphical display

9 Changing the Batteries of the *ISAQ 100-A*

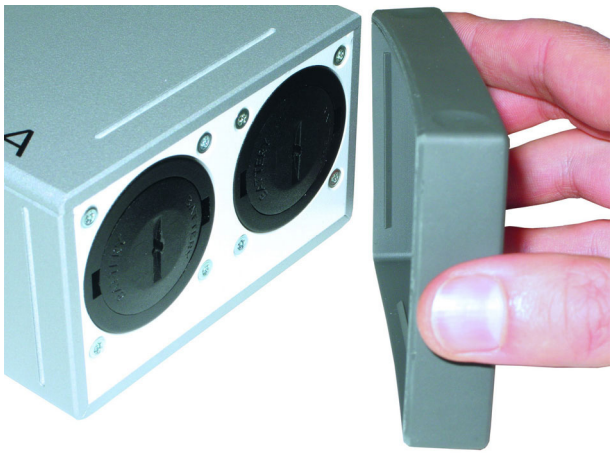
Caution: Before using the *ISAQ 100-A* for long-term measurements, check the battery status in the *ISAQ Measurement Suite* (see 7.5 "Device Configuration" on page 89). If the battery status indicates that the batteries are low, we recommend to change the batteries as described in this section.

Caution: Use only a 3.6 V D type lithium battery size D 2×ER 34615.

To change the batteries:

Warning: Disconnect any input signal from the input of the *ISAQ 100-A* before removing the rubber cover.

1. Remove the rubber cover at the rear of the *ISAQ 100-A*.



2. Turn both battery socket caps to the left by using a fitting coin to open them.

3. Remove both batteries by sliding them out of the battery sockets.

4. Replace the batteries by sliding the new batteries into the battery sockets. Ensure that the minus pol goes in first.

5. Remount the battery socket caps by pressing the batteries into the battery sockets and turning the battery socket caps to the right by using a fitting coin.

6. Remount the rubber cover by pressing it to the rear of the *ISAQ 100-A*.

10 *SG 100* Signal Generator

The *SG 100* signal generator delivered with your *ISAQ 100* system generates signals of different form and frequency for testing your measurement setup.

It is recommended to power the *SG 100* signal generator with the delivered power supply. In general, you can use any DC power supply fitting the input range from 9 V to 20 V DC. When the *SG 100* signal generator is powered, the green LED lit.

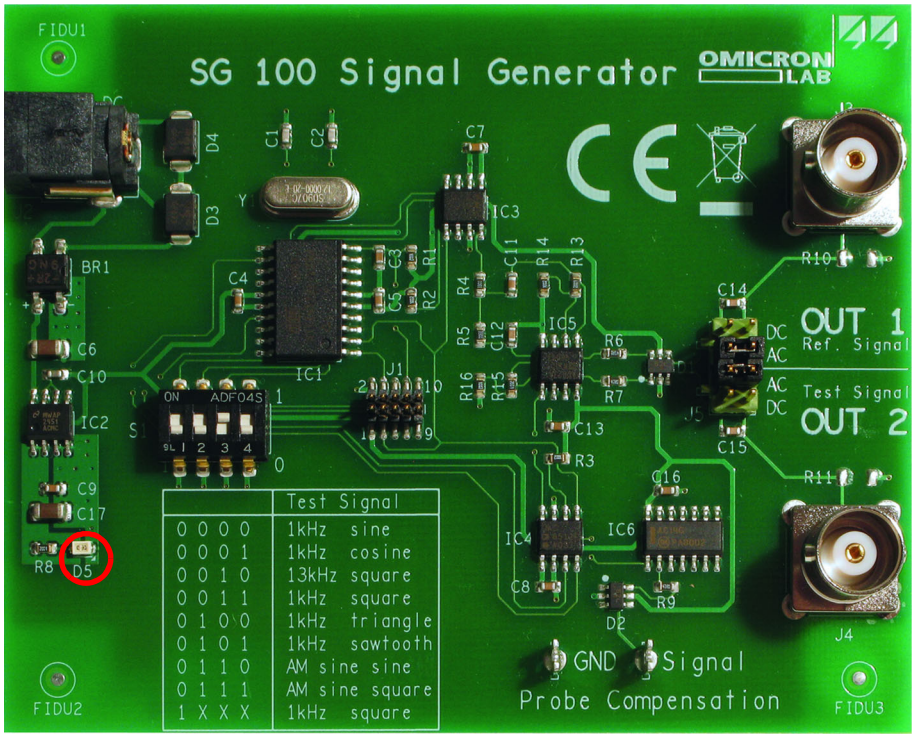


Figure 10-1 *SG 100* signal generator: green LED

The *SG 100* signal generator provides a square signal with steep edges designated for the compensation of your probes.

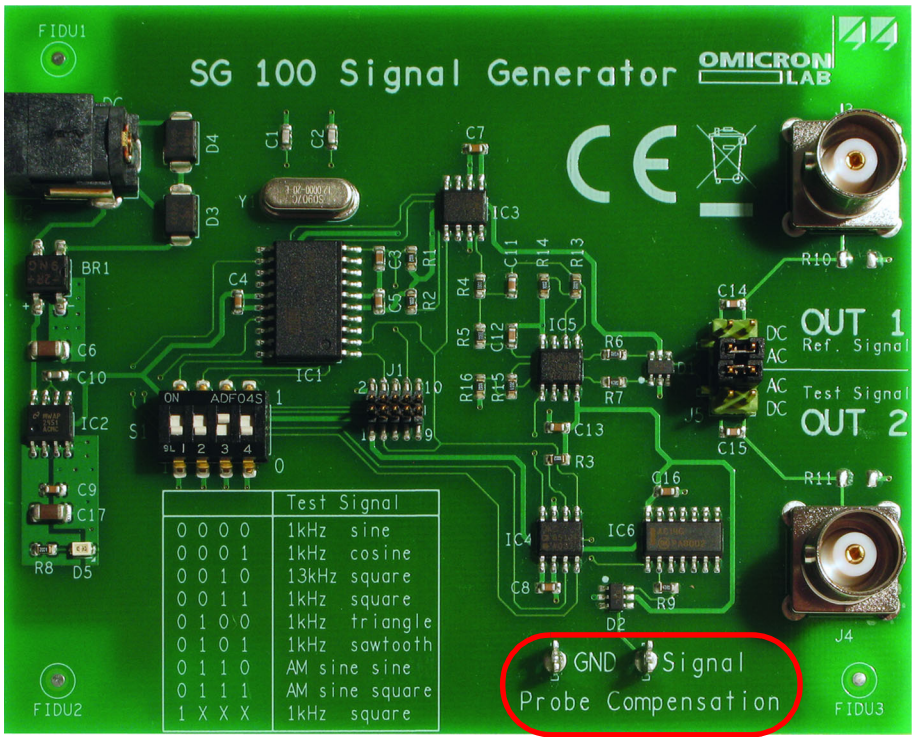


Figure 10-2 *SG 100* signal generator: probe compensation signal

The peak-peak output voltage of the *SG 100* signal generator is between 4.5 V and 5 V. Both outputs **OUT 1** and **OUT 2** can be AC or DC coupled by setting the respective jumper.

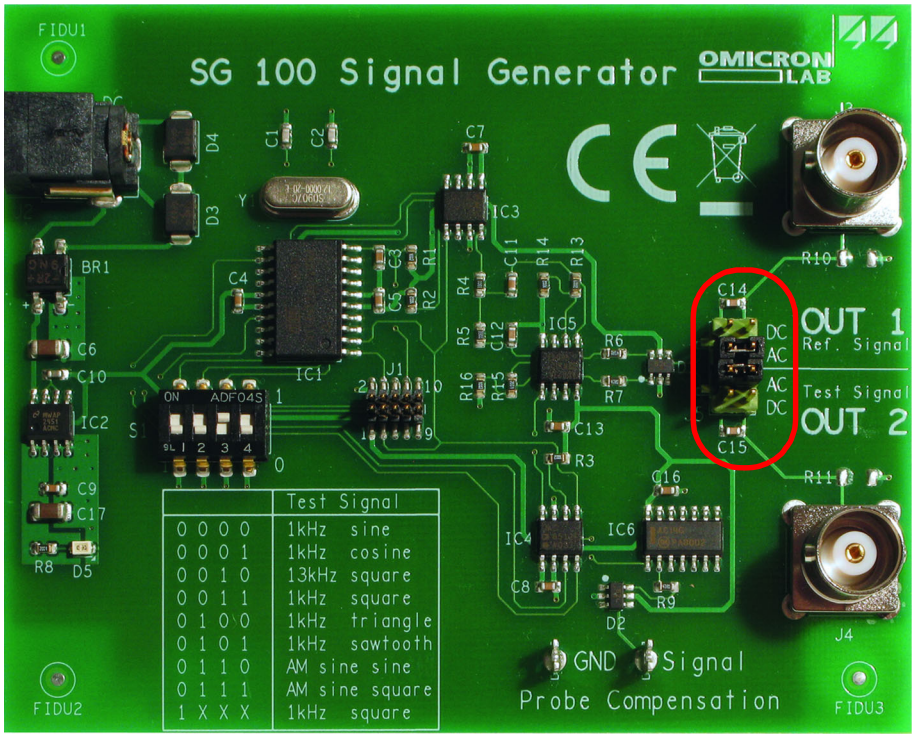


Figure 10-3 *SG 100* signal generator: jumpers for setting the coupling

The *SG 100* signal generator provides the following outputs:

- **OUT 1**, 1 kHz sine signal reference output
- **OUT 2**, test signal output. The signal on the **OUT 2** output can be set by a switch according to the table printed on the PCB. To set 1, move the switch to the upper position, to set 0, move the switch to the lower position.

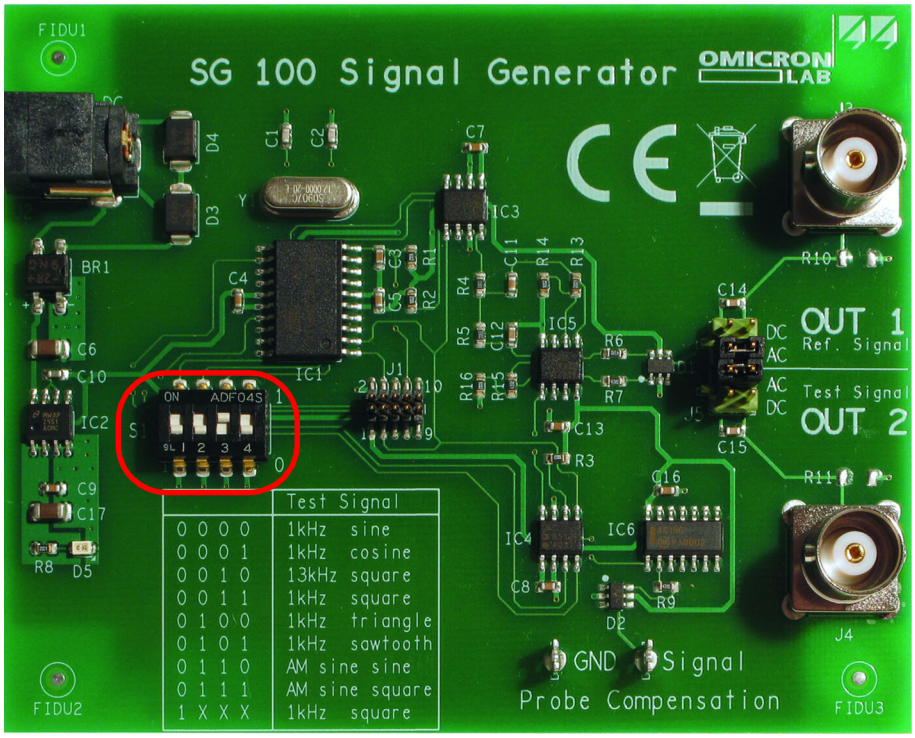


Figure 10-4 *SG 100* signal generator: switch for setting the test signal

Note: To generate a signal symmetrical to ground, set AC coupling (see Figure 10-3 "SG 100 signal generator: jumpers for setting the coupling" on page 111).

11 Technical Data

11.1 Specifications

Table 11-1 *ISAQ 100* System Specifications

Characteristic	Rating
Sample rate	2 MSps, 18 bit
–3 dB bandwidth	320 kHz
Passband	DC…250 kHz ±0.1 dB
Number of channels	2

Table 11-2 *ISAQ 100-A* Specifications

Characteristic	Rating
Analog Inputs	
Connector	BNC
Input voltage range	0.64 V, 10 V, 50 V, 250 V
Input impedance	1 MΩ // 40 pF
DC voltage accuracy	0.02 % of reading + 0.04 % of range
Temperature coefficient	10 ppm/ºC of reading + 10 ppm/ºC of range
Maximum noise amplitude	< 0.04 % of range
Fiber-Optic Interface	
Connector	ST
Cable	50/125 µm multimode
Maximum length	3 km
Output	850 nm VCSEL
Class	Class 1M according to IEC 60825-1

Table 11-3 *ISAQ 100-C* Specifications

Characteristic	Rating
Trigger	
Line	Optical
External BNC	TTL, ±20 Vmax
USB Interface	
Connector	Type B
Data transfer rate to hard disk	16 MByte/s
Fiber-Optic Interface	
Connector	ST
Cable	50/125 µm multimode
Maximum length	3 km
Output	850 nm VCSEL

Table 11-4 *ISAQ 100-A* Power Requirements

Characteristic	Rating
Power dissipation	12.8 mW
Standby power	20 µW
Battery	Lithium-thionyl chloride, size D 2×ER 34615, 3.6 V, 19 Ah
Battery lifetime	8000 h (24/7) 8 years (4 h/day, 250 days/year)

Table 11-5 *ISAQ 100-A* Absolute Maximum Ratings

Characteristic	Rating
Maximum AC input signal	200 Vrms (CAT II)
Maximum peak input signal	300 V
Maximum working voltage to ground in laboratory environments	1000 Vrms (CAT II)

Table 11-6 *ISAQ 100* System Requirements

Characteristic	Requirement
Operating system	Windows XP SP3 and later 32-bit Windows Vista SP1 and later 32-bit Windows 7 32-bit and 64-bit
CPU	Intel Pentium 4 2.5 GHz Intel Pentium M 1.5 GHz AMD desktop and notebook processor families (Athlon, Phenom, Turion)
RAM	1 GB or more, 2 GB recommended
Display resolution	1280×1024 or higher
USB interface	USB 2.0 Hi-speed compatible

11.2 Environmental Conditions

Table 11-7 Environmental Conditions

Characteristic		Rating
Temperature	Operating	–20 ºC…+60 ºC/ –4 ºF…+140 ºF
	Storage	–20 ºC…+60 ºC/ –4 ºF…+140 ºF
	For specifications	+23 ºC ± 5 ºC/73.4 ºF ± 9 ºF
Relative humidity		10 %…90 %, non-condensing
Max. altitude		2000 m

11.3 Mechanical Data

Table 11-8 Mechanical Data

Characteristic	Rating
ISAQ 100-A	
Dimensions (w × h × d) (without connectors)	11 × 7× 17 cm/4.33 × 2.76 × 6.69 inch
Weight	0.80 kg/1.76 lbs
ISAQ 100-C	
Dimensions (w × h × d) (without connectors)	11 × 3 × 17 cm/4.33 × 1.18 × 6.69 inch
Weight	0.52 kg/1.45 lbs

11.4 CE Conformity and Safety Standards

Table 11-9 CE Conformity, Safety Standards, EMC

CE Conformity	
The product adheres to the specifications of the guidelines of the Council of the European Community for meeting the requirements of the member states regarding the electromagnetic compatibility (EMC) Directive 2004/108/EC and the low-voltage Directive 2006/95/EC.	
EMC	
Emission Europe International USA	 EN 61326-1 Class A IEC 61326-1 Class A FCC Subpart B of Part 15 Class A
Immunity Europe International	 EN 61326-1 IEC 61326-1
Safety Standards	
Europe International USA	EN 61010-1 IEC 61010-1 UL 61010-1

11.5 Cleaning

Warning: Prior to cleaning disconnect the *ISAQ 100* system.

To clean the *ISAQ 100* system, use a cloth dampened with isopropanol alcohol or water.

Contact Information / Technical Support

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